REPORTS OF THE NATURAL HISTORY CLUB OF PHILADELPHIA

GE

V.1-7, 1868-74
506
N219

V. 1-7, 1868-74

LIBRARY OF THE UNIVERSITY OF PENNSYLVANIA

[illegible]506
N219

GIFT OF
Dr. Emily G. Hunt
to
Bartram Mem. Lib.

Annie Shoemaker.

Presented to
The Bartram Memorial Library
of the University – by
Dr. Emily G. Hunt

List supplied by Dr. Emily G. Hunt in letter to Dr. J. M. Macfarlane, dated "12/5/1927". The volume was presented by Dr. Hunt from Alice Pitman, who received it from their mutual friend and teacher Annie Shoemaker of Friends Central School.

The Natural History Club of Philadelphia.

Organized 4. 21. 1866.
Disbanded 10. 14. 1875.

Members.

John Gibbons Hunt M.D.
Anna M. Hunt.
Charles Shoemaker M.D.
Martha Shoemaker
Annie Shoemaker
Emma Walter
Mary S. Hillborn
Sarah Cooper
Annie Cooper
Susan Roberts
Caroline A. Burgin
Virginia A. Crawford
Eliza C. McDermott
Elizabeth Roberts Haines

Margaret W. Twaddell
Elizabeth L. Tenbrook
Alfred Moore
Rachel L. Bodley, M.D.
Anna Kaighn Smith, the originato
Jane P. Grahame
Isaac Comly, M.D.
John G. Moore
Lydie Gillingham
Carrie A. Boice
James B. Walter, M.D.
Ann Preston M.D.
Elizabeth C. Warrington, M.D.
Mary E. Allen, M.D.
Delia B. Burt
William W. Twaddell
Lizzie Shreve
A. P. Garber, M.D.
Emeline H. Cleveland, M.D.
S. Amelia Scull
Martha Laird
Above list supplied by Miss Emma Walter.

AN ADDRESS

DELIVERED BEFORE THE

Natural History Club of Philadelphia,

BY

J. GIBBONS HUNT, M.D.

AT ITS

FIRST ANNUAL MEETING.

Published by Request of the Club.

PHILADELPHIA:
THOMAS WILLIAM STUCKEY, PRINTER,
403 NORTH SIXTH STREET.

506
N219
✓ v. 1-7, 1848-1856

AN ADDRESS

DELIVERED BEFORE

The Natural History Club of Philadelphia,

December 3d, 1868.

IN accordance with the rules which govern our Club, it becomes my duty on this, our first Annual Meeting, to present a slight resumé of the work that has interested us during the past year. What a tonic to *healthy organizations* there is in that good, old, homely Saxon word *work!* The nerves throb with a fresher life, and the muscles harden at its sound. Blessed is he or she who *can* work!

We make no claim to have widened the boundaries of science in any direction; but it has been our pleasant and, I trust, *not profitless* occupation to have walked together along many flowery paths which had been trodden by other feet than ours. "Who never walks, save where he sees men's tracks," it is said, "makes no discoveries."

Is it the best thing a man or a woman can do, to make a discovery? to add some new species, or even facts, to the treasury of science? Is it fruitless work to cultivate a *love* for whatever *is* lovely, and pure, and beautiful in Nature? to grow familiar with the *common* things adorning life's road on every side? It is not a wearisome grammar that teaches the voice, and mood, and tense of all the tongues

578655

19 Jl 27 G. of Jr. Emily G. H. " To Bartram Mem. Lib

that sing to us in the glad Summer time, or more sternly warn us in the Winter. We have been searching only for the key to unlock a few of the storehouses in Nature's magnificent temple; and if we have found it of iron, and a little rusty in the beginning, better use will polish it, and possibly transmute it to gold.

Our several meetings have been occupied chiefly, though not exclusively, with botanical studies, and to that subject I shall, in a great measure, confine my remarks this evening. A large portion of our work has been the analysis of plants, in order to find their names and position in classification, and we cannot deny that, sometimes, we have found this to be pretty earnest work. But this is a preliminary training which every botanist must have. Before he can repose on the high and moss-grown banks from which a general view is gained of the vegetable kingdom, he must walk in toil along the hard and dusty road of analysis. Step by step only, like children learning to walk, can we advance, understandingly, in our botanical studies. We have found difficulties in the path,—rocks have impeded us; briars and thorns have sprung up just where we thought roses should have bloomed; but never have we despaired of the final truth. It is not possible to practise much the scientific analysis of plants without, at the same time, disciplining the mind in all those intellectual faculties which best develop its strength, and fit it for life's most responsible duties. It compels the student to weigh cautiously every fact, and to compare each fact with others related. The habit of careful, discriminative observation is continually exercised,—sight, touch, and often the taste, each brings to the bar of judgment its treasury of facts; and thus cautiously proceeding, without taking anything for granted, a chain of evidence is linked together, binding the *un*known to the known, and of strength sufficient to bear the richly-jeweled crown of Truth. Equally,—yes, I will say *better* than the mathematics or languages, does the proper study of Natural Science develop the intellectual faculties and strengthen the judgment, and equally with them does it exercise habits of profoundest reasoning and of trained observation. "There is a great difference," says Professor Huxley, "between literary men and those who have had a thorough scientific training. In the world of letters, learning and knowledge are one, and *books* are the source of both; whereas, in science as in life, learning and knowledge are distinct, and the study of *things*, and not of books, is the source of the latter."

But the labor we have given to the analysis of plants has become a pastime, and now we venture to play a little along the road we once pursued, doubtfully and with sweating brows. Seldom now have we difficulty in referring a plant to its proper natural order, and thus have we learned the first great practical lesson in our science.

On March 15th, Flora sent her first gift of flowers to the Club. The little DRABA VERNA and the SYMPLOCARPUS FŒTIDUS came out in time to hear the first croakings of the frogs, though both plants are often found earlier than that date. Then, swiftly following in the warm woodlands and the sunny meadows, we heard the coming footsteps of EPIGEA and STELLARIA and CLAYTONIA. The HEPATICA, too, soon opened its white and blue eyes, and SANGUINARIA felt its red blood stir in the early spring-time. There is a joy inspired by the Spring's first blossoms, not felt by the later gifts of the season; and they have a *personality* not belonging to the, perhaps, richer gifts of Summer. They are the early notes,—heralding the coming of that Divine Spirit which rides the sunbeam, and which sings to us a language like this:—

"I am the spirit which dwells in the flower;—
Mine is the exquisite music that flies,
When silence and moonlight reign over each bower,
That blooms in the glory of tropical skies.
I woo the bird, with his melody glowing,
To leap in the sunshine and warble its strain,
And mine is the odor, in turn, that bestowing,
The songster is paid for his music again."

It would be wearisome and profitless, at this time, to note all the plants which came before us at our Summer meetings. Our weekly excursions in the country furnished rich harvests for analysis, and it has been not rare for more than one hundred species to be reported on those occasions. Probably most of our commoner plants have been on our table, as well as not a few of those the books call rare. It is affectation in a botanist to love and search for only the *rarities* of his science. True, as plants are ordinarily studied from books and in schools, the student wearies and is driven over hill and dell to search for something really fresh and interesting. The common flowers we played with in our childhood, and wreathed in chaplet or love-token, ever shall remain the pets of our manhood, and over our grave we would prefer to have the Violet and the Columbine mingled with Innocence rather than the scented Rose of Persia.

"Can any please,
And light the infant's eye like these?
No! no! There's not a bud on earth,
Of richest tint, or warmest birth,
Can ever fling such zeal and zest
Into the tiny hand and breast."

In the Middle Ages, the prize awarded to the best poet was a golden Violet:—

"And in the golden vase was set
The prize,—a golden Violet."

"The Romans used to make wine of violets, and the Turks still infuse it in their sherbet. The Highland ladies of former times used the violet as a cosmetic,—the old Gælic receipt being: 'Anoint thy face with goats' milk in which violets have been infused, and there is not a young prince upon earth who will not be charmed with thy beauty.'"

In our plant-studies, we have neglected no opportunity to learn, as much as possible, of the tissues which built up the great fabric of the vegetable kingdom. Cells, in their numerous modifications of size and form and grouping, with their often delicate and beautiful markings, bearing rich deposits of starch or gum, or fragrant oil, or sparkling with raphides, have been somewhat studied. The spiral vessels and ducts, which creep through the other tissues like arteries through our bodies, are quite familiar to the class. The anatomy of the leaf, in its beauty and complexity,—of the stem, in both its types in flowering plants,—of the stamens and pollen,—have claimed a share of our notice. I state only a common truth, when I say that no other botanical class in the city has better facilities for the study of vegetable anatomy, or has given more attention to that important department of botanical science.

It is a delusion to suppose that a scientific knowledge of plants can be taught from books or charts. These will help in showing what ideas others have had on any subject; but, in Botany—which is a demonstrative science—the student wants ideas of his own. He must see with his own eyes, touch with his own hands, and work with his own brains. The teacher should instruct each student how to isolate each one of the plant's tissues from the other, in order that a separate study may be given to each, and then, by sections cut from the mass, all these separate elements should be studied, as they are united to form the several organs. The student should be taught, as an illustration, to take a leaf and separate it into its primary tissues,—in one vessel to put the epidermis, in another the parenchyma, in another the wood-cells, and so on with the spirals and ducts and raphides and glands and latex tissue, if present, and all should be perfectly clean, and then he should be instructed how to preserve all these in a way best suited for scientific study. And until he masters, in this way, the elements of his science, he never can rise to the sublime conception of the Divine idea as figured in a plant. *Then* does botany become a science proudly holding her head on a level with mathematics or the languages, as a means of intellectual culture. But is botany *so taught* in our schools or our colleges? Let teachers furnish the answer.

During the hot summer months, the Club held no regular meetings: the members absent in the country sent in reports. From Pennsylvania's beautiful mountains, in Potter county, came STREPTOPUS ROSEUS, CLINTONIA BOREALIS, and VIOLA BLANDA,—positively that, and not PRIMULIFOLIA nor LANCEOLATA, into which forms the BLANDA sports in this vicinity, —V. ROSTRATA, and CANADENSIS. We were told, too, that the TRIENTALIS AMERICANA and the beautiful WALDSTENIA FRAGAROIDES mingled their starry flowers in the Hemlock's shade, like Purity and Truth, under sorrow,—sometimes, though rarely,—mingle in the commerce of men. We saw the rugged mountain-rocks, those sentinel-watchers of the toils of men, girt by the clasping arms of EPIGEA in full bloom, and the TIARELLA and DENTARIA hung their delicate flowers from heights not easily reached by human foot. Oh! how much there is in our science to call us upward, and to entice us to turn our eyes, at least, toward the stars! Over all these early gifts of Summer, pouring their fragrance over mountain-rocks, like childhood perfumes and gladdens age, hung the Columbine. Folly's flower! its clusters of spurred petals resembling a fool's cap, rather than a nest of doves.

"Then gather roses for the bride,
  Twine *them* in her bright hair,
But, e'er the wreath be done,—oh! let
  The Columbine be there.
For rest ye sure, that follies dwell
In many a heart that loveth well."

From the roar and damp spray of Niagara, we are told of the EUPHORBIA HELIOSCOPIA, (is it so called, because it stares at the sun without winking?) and of the CALAMINTHA GLABELLA, or the "beautiful mint" (looking like just what it is not), and the ISANTHES: of course, we have all seen CALAMINTHAS enough. From the old fort of Ticonderoga, after war's barbaric strife has passed away, springing from a soil consecrated by the blood of American soldiers, were gathered twining Harebells. Grace and beauty meet in this plant, as in no other. Child of the light! Ellen's airy foot, near Loch Katrine, could not tread thee to earth:—

"E'en the slight Harebell raised its head,
Elastic from *her* airy tread."

At Trenton Falls, too, it hung from the lips of the wet rocks in company with CYSTOPTERIS BULBIFERA.

Nearly all our reports speak of the EPILOBIUM, and of the GERANIUM MACULATUM, so widely are they distributed. From the Delaware Water-Gap ten Ferns are reported, but most were familiar to the Club. The sweet voice of a member comes to us from the old mossy well where Molly Pitcher rendered herself famous by drawing water for our wounded and thirsty soldiers on June 28th, 1778. It is natural to link our love of flowers with the shrines of our country, which memory still cherishes.

The old "Tennent Church,"—the oldest in New Jersey now used for worship,—daily sweeps its shadow over soldiers' graves who fell in our great struggle for liberty. Strangers visiting it are shown its box pews and quaint galleries, its high pulpit and sounding-board, and the visitor sits thoughtfully on the rough seats, stained with blood, where soldiers slept in days of battle. The same member measured a hill of corn morning and evening for two weeks, and found the growth was two and a-half inches in the daytime, and five inches during the night. And corn growing near some purple beans had its cobs purple when gathered. Here are two important *facts*.

From Bordentown, New Jersey, we are told of CALOPOGON and DROSERAS, and CEPHALANTHUS and NYMPHÆS; and from farther down the State,—a dismal place for memory to run back into,—it is said the LYGODIUM and HABENARIAS, and POGONIAS and Floating Hearts grow. Well, from the mountain and from the sea, came familiar voices: from Wyoming Valley we heard the Harebells ring; and in Buck Valley, we are told the Flora resembles that of the Schuylkill. HABENARIA FIMBRIATA, with its liquid ciliated lips, told us it grew near Watts' Gap, in the Bunker Hill range, in close company with RHUS VENETATA. Poison and splendor, how often are they allied in this life! From Maryland, from Loudon's hills, and hills of Carroll, we look on the same carpet that covers *our* landscape. From hills and from meadows,

> "Where brooks run along,
> With their sweet sing-song."

have our working members sent us the glad tidings, that the Spirit of life which first whispered to us in the Spring from the little DRABA VERNA, has "mantled all the land and leaves and grass, and mossy-tinted stones, with Summer glory." "Therefore, let us greet each wandering flower-scent as a boon from *Him*, each bird-note quivering 'midst light Summer leaves, and every rich celestial tint unnamed, wherewith transpierced, the clouds of morn and eve, kindle and melt away."

I would be doing injustice to the Club, did I not allude to our work in cryptogamic botany. This department, so puzzling to students often, we have not found to be surrounded with insurmountable difficulties. Some members of the class could identify a spore of EQUISETUM, if picked up at random in the forest; and we are all familiar with the Silica in the epidermis of this order.

Of the sixty Ferns mentioned in our books, we have learned the physiognomies of thirty-five. Their jewel-like spore-cases, at maturity, bursting and sowing the golden germs of other generations, and often carved with gorgeous tracery, you know, have always interested us. But we have found occasion to study more closely than this the marvelous biography of the Ferns.

If we germinate a seed,—I mean the embryo in the seed, —we get a plant resembling that which produces the seed.

But in the germination of a spore we have observed a different result. It passes through several preliminary stages before it reaches its final development. It climbs, step by step, the devious ladder of life. Indeed, "nothing in the living world is made at once fit for the highest purposes of which it may be capable. In all the countless crowds of living beings,—in all the countless particles of each,—there is not one but in the history of its life we may read a *gradual* attainment of its highest destiny; not one but has a time in which its true purpose is yet future; its true design yet unfulfilled: and although even in its rudiment it is not useless, yet there will be a time when, with higher powers, it will take part in the designs of a more perfect state." We have seen the spore of the Fern germinating,—first, a little vesicle appears on one side; this assumes the form of a little filament,—a few little cells *in a row*, resembling the Conferva, one of the lowest families in the Cryptogamic series. Next, this row of cells has others added to it on either side, until a minute membrane or frond is formed; and each cell is now filled with chlorophyl; and this is the prothallus, or second step, and resembles in appearance the Liverwort, an order higher than the Conferva.

On one part of this prothallus are developed cells of a peculiar kind, and set apart for a special function. The life of the spore is now about to evolve those singular organs, which are analogous in function to the stamens and pistils of the flowering plants. Nature's processes are wonderfully uniform, whether she fashions the feathery Fern in the meadow or rears toward heaven the marvelous column of the SEQUOYA GIGANTEA. On this prothallus round cells appear, elevated somewhat above the general surface; these are soon filled with secondary cells, which presently give evidence of a singular motion in the interior of each. Gradually all enlarge, and soon these secondary cells rupture and give exit to the antherozoids, which are minute cells of a definite shape, and driven about in the water by cilia attached to one end.

The organ we have described is the antheridium, and it has matured millions of motile cells, each one of which represents the life of the future Fern. So minute are these bodies, that countless millions of them might spin out their brief lives in a tear-drop. On what a slender thread, now, does the life of the Ferns depend. Cells a thousand times too small to be seen by unassisted eyes, swim around in oceans formed of dew-drops, each freighted with its infinitesimal cargo of life. Let danger or shipwreck come, now, to these antherozoids, and the south winds of the coming seasons would search the woods and the meadows for LYGODIUM and ONOCLEA and OSMUNDA in vain. On other parts of the prothallus, cells of another kind are formed, arranged one on the other around a central canal, like bricks in a chimney, and these little organs,—called pistillidia,—are elevated quite above the surface of the prothallus. Down at the bottom of these pistillidia lie the embryos of the future Ferns, and there would they lie forever, did not the antherozoids descend these little chimneys, and come in contact with the embryos, and thus start into life a new growth, which soon develops into young Ferns. Do we not love these graceful plants more, after having studied out their biography in this manner? We cannot avoid the conviction, that the poetry of facts and of science is richer than fiction; and *blind* would we be, if we failed to see, in our study of the Ferns, that the same mysterious Power which keeps the smallest planets ever nearest the sun, nurses, also, these plant-atoms, sporting, as it were, in the very cradle of life.

Our work among the Mosses has revealed a history closely parallel with that of the Ferns. Their capsules carved, often with beautiful stomata, and fringed with the peristome,—single in ATRICHUM, double in MNIUM: the OPERCULA, ANNULUS, COLUMELLA, and swarming golden spores are familiar to every member.

Among the Liverworts, too, we have made some acquaintances. MARCHANTIA has shown us *its* flask-shaped antheridia and swarming antherozoids: its pistillidia resembling those of the Ferns; its beautiful stomata built up over fairy grottoes lying in the fronds. Its oval spores and twining elators, as well as those of GRIMALDIA and PELLIA, and ANEURA and others, have passed over the fields of our microscopes. We have noticed the exquisite spiral cells lining their capsules, and noted their analogy with similar structures in the anthers of some flowers. At the right season, Nature turns the key, and these spiral elastic cells, in the capsule and in the anther alike, spring open, and scatter the spores or pollen abroad.

In the boundless harvest-fields of the Lichens and Algæ and Fungi, we have gleaned only enough to awaken a desire for further knowledge, as opportunity shall offer. Deeply interesting has been our work among the Cryptogams, and many have been the beautiful chapters revealed to us in this department of Nature's magnificent volume. Pages written in small type, you may think; but each letter is stamped in charming shape, and shines with a lustre, only less than that of the stars.

"In every clime, on every shore,
They cling, or creep, or twine;
Where bleak Norwegian winters roar,—
Where tropic summers shine."

I have been speaking of the past. Let us now send our thoughts onward, a little into the future. You will all believe me, when I say there is still some work waiting to be done. The *naming* of a species is not of principal importance in the scientific study of botany. We have found it desirable to learn a few hard terms, and quite easy to *forget* a great many. But to know a plant, is to have familiarized ourselves with a thought of the Creator! to know its name, is to have learned only a fragment of the ever-changing systems of men.

Shall we ask of the coming year a few reasonable questions? The Squirrel Corn (DICENTRA CANADENSIS) is a plant easily obtained in this locality. Why are its six stamens united in *two* sets of three each? and why has the middle anther of each set two cells: the lateral one *only* one cell? Does each kind of anther, in this plant, produce pollen alike in form, and alike in function? and which pollen is it that fertilizes the plant? Or in LESPEDIZA, where the anthers appear to be alike, why is one stamen left standing alone, and nine others united? Is it pollen from the nine, or from the solitary one, that is commissioned to transmit the life of the plant, after its own kind, forever? Where such a difference in form is so apparent, may it not be *possible* a difference in function exists too? and the detection of that difference, if it exists, or the proof of its absence, would be as interesting, perhaps, as the identification of all the species of this rather puzzling genus. You remember that bouquette of Fringed Gentian which came before us at a recent meeting, with its petals blue and dark and cold, like patches of the wind-clouds of October! It cannot be cultivated in gardens; it never makes its home under the rich man's window, nor does it listen to the hum of the wheel in the poor man's cottage. Is it a parasite? Will it bear no nursing, save in the lap of its wild mother, Nature? hear no song, but the wild laugh of the rill? Questions like these are waiting solution:

> "And so the 'thought' intently gleaning,
> O'er fields of 'yet unwritten' lore,
> May light upon a holier meaning,—
> A meaning never found before."

In this way then, my friends and comrades, have I endeavored to recall some of our pleasant recollections of the past year. Only a few crumbs from our weekly table have I brought here this evening, more for refreshment than solid nutrition. I have not said all. Perhaps the best part of every mind is just that which is left unsaid; as, when the water is poured from the glass, some always lingers at the bottom. The time we have spent in our semi-scientific, social meetings has not been profitlessly spent. Our efforts to keep a little life in the tree of knowledge have elevated somewhat the tone of the society in which we have daily mingled; and as we have learned to live in more intimate fellowship with the natural world,—which is but the foreshadowing of the supernatural,—I indulge the hope that we may have gathered a *little* strength against the day of trial. We have seen the flowers of Summer fade, and stern Autumn come, and with his pale and frosty fingers streak the leaves with gold and purple before he blew them into dust; and my concluding wish for each one of you, my friends, is, that when *your* leaves of life shall drop, you may come out in glory, like the Witch-Hazel, after all these summer beauties shall have passed away.

ANNUAL ADDRESS

BEFORE THE

NATURAL HISTORY CLUB

OF

PHILADELPHIA,

Delivered December 16th, 1869.

BY

J. G. HUNT, M. D.,

(President of the Club.)

PHILADELPHIA:
R. HOSKINS & CO., STEAM POWER PRINTERS, 913 ARCH STREET.
1870.

FRIENDS AND COMRADES:

Another year is gone, and we convene this evening to hold the Second Annual Meeting of our Natural History Club. It has been deemed a good custom by well-meaning people to look back each evening over the events of the day, and our rules make it my duty, on this occasion, to take a retrospective glance at some of the work that has interested us during the past year.

The study of general Natural History should become more common, in what is called good society, than it now is. The true work of life is earnest and manly, and if we cultivate a closer acquaintance with the natural world around us, and learn to live in nearer sympathy with all its beautiful compensations, we can afford to look across the lower plane of fashionable life without experiencing regret or loss. I am not encouraged to look for much help in this direction from our academies or schools of learning. Around each of these high places in the realm of natural science a centralizing influence exists, which seeks to draw all effort within its own circle.

Greek and Latin are still permitted to occupy the time which a modern American civilization demands shall be devoted to natural science, to that practical culture of *things* which is adorning and ameliorating every condition in life, and blessing mankind with legacies of utility and wealth. Moreover, few of our acknowledged seats of learning are far enough advanced in the enlightened spirit of equality which marks the age, to invite women of culture and scientific taste to join with men in their scientific pursuits. A few earnest men and women in each neighborhood, however, may do much in encouraging a taste for natural science, and if they cannot reap *all* the golden fruit ready to drop from the tree of knowledge, they may obtain enduring satisfaction in breathing the perfume distilled from its blossoms. Nature is generous in her gifts; to the child of genius she unlocks her secret places, and to us, her *younger* children, she offers rewards in proportion to our merits. We disclaim all pretension to be pioneers in such studies as have come before the Club; we follow only doubtfully in the footsteps of those who have gone before.

Within the past year the range of our studies has been materially extended. Separate sections on Ornithology, Entomology and Botany have been formed, and regular bi-monthly reports on these subjeets have given variety and perhaps accuracy to our studies. In ornithology, the skeleton of a bird very properly formed the starting point of study. In many points of difference or resemblance to the other vertebrates, places of attachment for the powerful muscles to carry these creatures through the air; the strong but light character of their bones; their peculiar respiration extending from the lungs through air-sacks in various parts of the body, and even into the hollow bones, thus filling the body of the bird with an internal atmosphere at a higher temperature than the external air, and therefore lighter, thus helping to lift the bird from the earth with the least expenditure of force. All these points have been before the Club, and their beautiful plumage, brilliant as the various colors of the spectrum; on some parts of the body soft and yielding as an infant's cheek, but on the wings hard and strong, with rib-like shafts, and with barbs grasping each other with rigid hooks to strike their prey or ride in triumph above the rattling storm. Our microscopes have shown that feathers are only epidermic appendages, having their histological parts differently arranged from hair or wool, in order to perform a different function.

After realizing that all systems in Ornithology are imperfect, we have adopted that proposed by Cuvier as best for our present wants. It divides birds into six classes, viz:

I. Accipitres,	Birds of Prey.
II. Passeres,	Migratory Birds.
III. Scansores,	Climbing Birds.
IV. Gallinæ,	Grain-eating Birds.
V. Grallæ,	Wading Birds.
VI. Palmipedes,	Swimming Birds.

Specimens of these primary classes have been before us, as well as illustrations of all the sub-orders, and help has been given on this subject by the accomplished artist of the ornithological section. The times of arrival and departure of many birds have been noticed by a corresponding member, and recorded in our minutes, and these beautiful companions of our country homes are acquiring an interest with our members not realized before.

Beyond all our classifications, let us not forget to study the bird for its own sake. The best instrument with which man recorded his thoughts for ages was plucked from the wing of a bird, and when we find portions of our own garments woven up in their nests in the orchard, they then touch our finer human sympathies eloquently indeed. Their affections often stronger than the fear of death,—may they not teach us a lesson?—their wonderful voice of song!

> "Hush! hush! the nightingale begins to sing.
> And stops as ill-contented with her note·
> Then breaks from out the bush with hurried wing
> Restless and passionate. She tunes her throat,
> Laments awhile in wavering trills,—and then
> Floods with a stream of sweetness all the glen."

" Man could not have lived without the bird, which alone could save him from the insect and the reptile; but the bird had lived without man. Man or no man the eagle had reigned on his Alpine throne. The swallow would not the less have performed her yearly migration. The frigate-bird unseen by human eyes had still hovered over the lonely ocean waters. Without waiting for human listeners, and with all the greater security the nightingale had still chanted in the forest his sublime hymn. And for whom? For her whom he loves, for his offspring, for the woodlands, and finally, for himself, his most fastidious auditor. Let man hunt the lion and the eagle if he *dare*, but let him not hunt the weak."

In the wide field of entomology, as in ornithology we have made only a beginning. The large number of genera and species among the insects are calculated to perplex the learner at first, but we have found order and well-marked distinctions existing here as everywhere else in nature. For our purposes the classification adopted by the American author Tenny has been accepted. He divides insects *proper*, into seven natural orders, viz.:

I. Hymenoptera	membranous-winged	insects.
II. Lepidoptera	scaly-winged	"
III. Diptera	two-winged	"
IV. Coleoptera	sheath-winged	"
V. Hemiptera	half-winged	"
VI. Orthoptera	straight-winged	"
VII. Neuroptera	nerved-winged	"

Those orders lower than the insects included in the above classification have not been before us for systematic study. Ample illustrations of the seven orders, in which their external characteristics were demonstrated under the microscope have been before us, and it has been our aim always to study the *natural* specimen, using books for illustration only when unavoidable. I need not remind the Club, of the revelations of structures, and of the beautiful adaptations of form, to conditions of life, which our modes of preparation and preservation have made plain to us under the microscope. Before we can fully appreciate the deep interest attached to the study of insects we must look beyond the beautiful surface. These little creatures are generally opaque, and as we find them naturally and in cabinets their anatomy cannot be made out. We must have therefore, some process by which their parts may be rendered sufficiently transparent for study. In order to obtain the best results we have taken the officinal liquor potassa of the shops, and allowed the insect to macerate in it for a time sufficient to soften its outer integuments. This will require a few days or weeks according to the hardness of the specimen. Then remove the insect to clear water, and after allowing it to soak for a short time wash well with a soft brush, and press the preparation between pieces of glass, being careful to adjust the wings, legs, jaws and other organs as naturally as possible. Confine the insect in this position by a string tied around the glasses and then deposit it still between the glasses, in turpentine until all the water is driven out. If dirt should now remain attached to the preparation, remove it from between the glasses and wash well *in the turpentine* until all is clean. After all the water is driven out by the turpentine mount the preparation in the usual way in balsam. But it sometimes occurs that a milky appearance surrounds the preparation after it is finally mounted, this is because water still remains in it, and it can be removed or obviated only by permitting the specimen to remain longer in the turpentine. Alcohol may be employed in place of turpentine to drive out the water, but care must be taken to get rid of all the water. If carbonate of potash be added to the alcohol employed for this process the alcohol becomes absolutely anhydrous, and in that case it may be substituted for turpentine. It will be perceived that the object has been to get rid of all the water in our insect, never during the process allowing the preparation to dry, for if it becomes dry as recommended in the books, air penetrates the hollow parts, and only inferior results are obtained. A few insects thoroughly studied by the help of the process I have just detailed will give new charms to our entomological pursuits. We have thus seen the complex organs of the jaws in the several orders their stings and ovipositors, andthe anatomy of the joints on a scale of minuteness not to be distinctly demonstrated in any other department of nature.

Even the muscles in the common house fly that open and shut its fairy wings 330 times in a second, or in the bee 440 times in the click of a pendulum vibrating seconds, with their points of attachment, may be demonstrated in this way. Only think of a muscle which the unaided eye cannot see, contracting and relaxing 26,400 times in one minute, hurling these organized atoms through the driving summer shower, and guided by a sense of sight and volition so quick as to dodge the rain-drops.

Safely may we anticipate pleasant work among the insects, these *half way birds.* And may we not study it too for its own sake?

Let me ask what means this grand emblem which we call wings as found in birds and insects all over the world? A deep and melancholy voice is forever ascending from our sad humanity, asking though we know it not for the royal gift of wings. All through our literature it finds unconscious expression. We rejoice in our steam because it helps free us from the impediments of time and space. Our fastest ships give us most pleasure, and we nurse the ever-vanishing dream, that one day, we too shall spread our wings of canvas or of steel and skim the continent, or scale the mountain peak like the bird.

"The tendency of every human being—a tendency wholly rational not arrogant nor impious—is to liken itself to nature, the great Mother, to fashion itself after her image, to crave a share of the unwearied wings with which Eternal love broods over the world. Human tradition is fixed in this direction. Man does not wish to be a man, but an angel, a winged Deity.

The winged genii of Persia, suggest the cherubim of Judea, Greece endows her Psyche with wings and discovers the true name of the soul—aspiration. The soul has preserved her pinions; has passed, at one flight through the shadowy middle age, and constantly increasing in heavenly longings.

More spotless and more glowing, she gives utterance to a prayer, breathed in the very depths of her nature and her prophetic ardor."—

"Wings, wings to sweep
O'er mountain high and valley deep
Wings that my heart may rest
In the radiant morning's breast.

Wings,! to hover free
O er the dawn empurpled sea.
Wings,! 'bove life to soar,
And beyond death forevermore,"

I will now turn our attention to the work of the botanical section, being conscious that I can give only an imperfect report. We have not found in our immediate neighborhood, a large number of botanical rarities; *new* acquaintances in this department will become less frequent as the years pass by. Earlier than last season Flora sent her contributions to our meetings. On February 20th, Ranunculus repens and Acer rubrum, in flower were reported to the club; and on the 21st, Draba verna and Symplocarpus were offered from the Jersey shore. Thence onward as the suns grew warmer came crowding hosts of *old* friends—none the less welcome for that—arrayed in their best robes, lovely and fragrant with the freshness of spring. The true heart that lives in healthful harmony with nature can still love old friends though their robes be marked with serrations and only the lone places in life know their presence and their fragrance.

Our frequent excursions in the fields and woods have continued to furnish us with ample material for study. Not only in the ease with which species are identified has the Club made marked progress during the past year, but the custom of appointing one of the party on each excursion to give the Club a written report has stimulated the habit of observation and brought to our meetings much that otherwise would have remained hidden. Many incidents connected with these excursions yet live in recollection, and are valued equally with the flowers we were seeking. Often did the summer shower drive us for protection beneath the sheltering arms of some forest oak or maple till the clouds passed by, and the doors of humble rural cottages have been open to welcome us in from the rain. Where we did not find genera and species for the student to analyze, we failed not to gather flowers of another kind blooming in the rude but kindly sympathies of human hearts. Indeed, "we need not travel through dreary wastes as did Mungo Park, nor turn back our thoughts to pre-Mosaic times and tarry with the angels before Abraham's tent to seek illustrations of a generous hospitality. In an humble home, in our own neighborhood, in these days called degenerate by the never-dying race of croakers, we found rest and comfort, warmth and kindly words—an experience, perchance as valuable as could be found in a successful botanical excursion. The herbs of our vasculums soon must wither away, but the flowers and the fruits that spring up in a kind and loving human heart know no decay—they bloom alike in the earthly as in the Heavenly Paradise."

To recognize in nature a personality that is ever present, and to listen reverently to that sublime hymn which is ever coming from the many inhabitants of the City of God,—the voice of the bird—the hum of the insect—good and kindly words and deeds coming from our own kind—the ripple of the brook, or the mightier voice of the angry waves of the sea,—the melody of June, singing in the tender leaves, or the hollow roar of the wintry blast as it sweeps through the leafless woods; until we learn to interpret each and *all* as voices of inspiration meant to do some good work in us, I hope will continue to be a portion of *our* work. Nature cannot be best studied alone with the intellect; the *heart* must furnish those emotional interpretations that will remain after the flower and the green leaf shall have passed away.

During the summer vacation several of our members who were absent from the city, sent in reports. From the land of the pines we are reminded that Calopogon pulchellus was found bearing *twelve* pink-purple blossoms in place of the "two to six" allowed it by Gray, (we have found the same plant having only *white* flowers.) Under the holly bushes wreathed with the evergreen tresses of Lygodium palmatum grew our old friends the Droseras. Their eyes were wet with the tears of the morning. But as it is only the *falling* tear that moves us, and as Drosera never drops its tears we tore it from the sand and carried it home for study. On some of the plants were long cylindrical glands differing widely from those known before, and these long glands throw off the sticky excretion on *only one side* whereas in the other or oval gland the excretion *entirely surrounds* it. These new organs surround the circumference of the leaf on long filaments, they expand *earlier* than those of oval shape, and are *sooner* to fade. They have not been detected before.

From the same side of the river one writes of the green trees each throwing its peculiar voice into the grand hymn of nature, and, with the wild song of the birds making a common brotherhood of life, rich, eloquent and full of compensations to one who had been a prisoner in the city for ten months of the year. Lowell tells us he has seen the robin in the fields when the thermometer marked fifteen degrees below zero, and our member confirms the fact that this bird remains with us all the year, "Summer would lose half its charms, were these old friends driven from the homes of our childhood," and it is good for those who can, to renew themselves in heart and faith by these summer visits to the scenes of their youth.

Some members left behind them their city weariness and went among the White Mountains to scatter their cares upon those everlasting hills. That only evergreen among our species of the order Polemoniaceæ, the Diapensia Lapponica, was found growing *above* the clouds, nestling its little stars in a soft bed of mossy green. The Alpine azalea, and Clintonia borealis found there, marked a region foreign to our weekly rambles. On Mt. Holyoke the twining harebells were found clinging to the hard rocks, even as recollection clings to that beautiful mountain landscape.

When the hot days of July came, another member "weary with constant communication with human society," sought a restoring alibi in the still country. "The very idea of perfect rest is inseparably associated with green trees, grass, birds and flowers. These are the natural and selected companions of our human lives, and there are times when they give us a sense of *rest*, and soothe corroding care as no human companionship can do. They never tire us by their importunities, they sing or soothe from the fulness and richness of their nature, and reprove only by showing their own perfectness.

From the landscape in Vermont and New Hampshire, the chestnut, the hickory and the oak, have almost disappeared, the beech and maple forming the firewood of the country.

"The elm grows more common as we go north, often attaining a great age. Near Saratoga one was felled recently marked with the circles of thirteen hundred years. The old historic elm on which Mary Dyer was hung in 1660, still grows on Boston common," after all the generation that believed in witches is happily forgotten.

Going up Mt. Washington, on that marvelous railway, mountain after mountain rising on the right hand and on the left and in front, amid the thrilling awe of that glorious panorama, note was taken of the trees. "The primeval firs and spruce that clothe the foot of the mountain, grew less, until at last, they became low spreading bushes, only a few inches high, then the stony heights were bare. Bare were they? Far above the region of pines, in the clefts of the cold rocks moist and fresh and exquisitely beautiful, bloomed in abundant greenish tufts, the little white Alsine Greenlandica." Oh why are these mountain blossoms lifted so far up above the toiling world, always *white*? "Where strong growths withered and died, this delicate flower smiles and cheers the beholder, like some gentle human spirit that unfolds its powers in adversity, and comforts and cheers when stronger hearts give up in despair.

Among the mountains the little Cornus Canadensis, smallest of that genus, adorned the wayside.

"The little silver chickweed, Paronychia argyrocoma—a recent discovery among these mountain plants—was found abundantly in Willey's Notch, resembling beds of rare moss." "The Clintonia borealis, and the *Linnea borealis*, beloved of the Swedish botanist, grew among the hills." Beloved by all botanists who have seen it, is this last plant:

"'Tis a child of the old green woodlands,
Where the song of the free wild bird;
And swaying boughs of the summer breeze
Are the only voices heard.
In the richest moss of the lonely dells
Are its rosy petals found;
With the clear blue skies above it spread
And the lordly trees around."

Thus has the generous north sent us, through the summer, a few thoughts and plants, not found by our Club before: let us now direct our attention southward.

During the year just closing, our enjoyments and compensations have been so great and varied, our material for recalling pleasant thoughts, now living only in memory, is so abundant, that I am almost baffled in continuing my report. How wonderfully nature reveals her beautiful sights to those simple enough in heart to profit by such teaching. And where she does not pile the mountain or trace the river, she still bestows enough to gratify our love for the beautiful. The homes of our ancestors, the spots we have loved in childhood—the old spring-house in active use an hundred years ago, and from whose well scoured churn came rolls of golden butter, are memories sent to us as precious as flowers.

Hydrocotyle umbellata, Diodea Virginica, Utricularia inflata, and that gem of all the Composites, Sclerolepis verticillata, reported by a member, are nymphs of the quiet waters not far from the sea.

From Buck valley Habenaria ciliaris is reported, and its beauty is so rare, its memory must not pass away from the club.

From Elk-ridge in Maryland, where the "wild fox digs his hole unscared," a member visited the mines of iron, where the rich ore containing ninety-five per cent. of pure iron is brought to the surface. While gathering plants among the hills, our member "came suddenly upon a colony of bumble-bees. These insects appeared to have their pickets stationed on the ground around their camp in order to spread the alarm if danger approached. Suddenly the bees proceeded to cover in their encampment from a pile of small shavings lying at a little distance. This they performed with astonishing rapidity, moving backward and apparently kicking the shavings towards the desired spot, and in three hours after the first alarm the whole was roofed in from mortal gaze."

Our eyes now wander further southward, towards Virginia, that land "of rock, river, caves and mountains." I see five fair ladies sailing on the James River, or staging it over hills and valleys, along shaded roads adorned with trees of Papaw and Crape-myrtle. Their destination, the "Peaks of Otter." Their hearts expand with love and adoration as they behold the panorama of the hills. The fragrant racemes of Oxydendrum arboreum hang over the clear mountain streams, and the bright pebbles in the water are moulded into nests by the sun-fish, to hold the eggs for the young brood. Nature's proper synonyme is maternity, and we come gradually to see why she has been called mother—that precious word which utters more of the heart than any other in the language. The road is turnpiked with boulders, but beautiful along its border with the rich purple flowers of Clematis viorna; Melanthium Virginicum; Veratrum parviflorum; and the Amianthium muscætoxicum, plants one would not have looked for in that locality. The lily-of-the-valley grew in its wild native home. But the mountain *is* climbed and our beloved friends rest on the granite rocks crowning the "Peaks of Otter." A glorious view opens before them. Swallows skim the exhilarating air around and overhead, while far below in the vanishing distance, buzzards, not bigger than flies, swoop down to their feast. Fondest anticipations are realized. Trophies of Dicentra eximia, of Saxifrages, of Heuchera villosa, are gathered from the rocks. "A few years ago thirty men pushed off the topmost boulder from the highest peak, and sent it crashing down the mountain side, to form Virginia's contribution to the Washington Monument." It was believed to have been the highest rock in the State. It is an honorable thing to travel, as did our friends, with a body-guard of Calamintha, Echium, Asclepias incarnata, cornuti and tuberosa; of Euphorbia and Verbena, names of equal distinction with any in military annals.

Escorted by such pleasant companions, our friends visited the Natural Bridge "so celebrated in the scenery of our country." The Bridge spans Cedar Creek, stretching across a chasm ninety-three feet wide and over two hundred feet deep, its two smooth parallel walls of stratified limestone inclining at the same angle, varying only a few degrees from the vertical." The linden trees and the Ostrea Virginica shade its nearly perpendicular rocks. "From the ravine below, the Bridge is seen to the best advantage, the peculiarity of the spot consisting in the deep gorge of Cedar Creek, whereas the Bridge is not elevated above the adjacent country. Perhaps it was once the top of a cave, but why all should have yielded but this one spot remains a mystery, and from its solidity it is apparent the insignificant stream now running in the gorge has had little agency in producing this wonderful chasm. Mightier forces, more powerful torrents than any that now flow over the surface have worn away these hard strata."

Asplenium ruta-muraria painted the cracks in the rocks with perennial green. Here flourished the ferns, luxuriating in their rocky home. Adiantiums, Aspidiums, Cystopteris bulbifera and the walking fern remind us of our home rambles.

How constantly I am reminded of the benefits coming from our simple Club studies, as I endeavor to glean a portion of their fruits for our entertainment this evening. Work done in the quiet of the home circle, in the press and glitter of city life, may qualify us to go abroad with intelligent understanding of all things. Let us, then, get knowledge, let us get light and we are safe. The lost hunter in the forest builds around him a rampart of fire—a rampart of light and rests in peace.

Our eyes are still turned southward, and we see our dear friends seated in a Jersey wagon going "bumpety bump behind a gray mare," along the road from Staunton to Weyer's Cave and the Cave of the Fountains. Too much occupied with the "obliging lad" the driver, or their own glad thoughts, they tell us only of Calamintha with its aromatic perfume; of Echium vulgare with its rough side turned out like others of its family, and of the green milk-weed. "The Acerates viridiflora is one of the few plants bearing green flowers. Nature reserves that color for grass and foliage, and gives us bright and varying tints in the crowning glory of vegetation the blossom." Soon our party reach a door in the hill-side marking the entrance to Weyer's Cave. "Fronds of Pellea atropurpurea more than a foot long looking like giants compared with the specimens found in this locality, grew in the limestone rocks." Our friends enter, and they see "stalactites and stalagmites innumerable and of various forms, now resembling rows of statuary; the shield of an ancient knight or hanging from the ceiling in the form of graceful drapery; in many cases this drapery is translucent, and if you place the lighted torch behind it, transmits a subdued light. It has also a peculiar sonorous property, and when struck by the guides produces musical sounds thought to resemble those of an organ." "Fountains' Cave is about 300 yards from Weyer's Cave and differs from it widely. Here is a much greater variety in the formations. In some places it is so wild and chaotic that it thrills one with a feeling of sublimity not unmixed with terror. It takes its name from the fountains which are found in it. There are several of these whose crystal waters flow into basins beautifully incrusted with carbonate of lime. They are marvelous in their beauty. What an almost infinite variety of forms may be seen! Upon a ledge reached by climbing was a bird's nest with three tiny eggs, which glistened like diamonds in the light of the candle." On emerging from the cavern, our friends thought the "light of the sun more glorious and beautiful than it seemed before."

"On the afternoon of July 28th, a neat barouche, a liveried coachman and four ladies in visiting toilet, drove slowly from the 'Farish House,' in Charlottesville." The showy blossoms of the Trumpet-creeper brushed against the passing coach, and the beautiful little Houstonia purpurea, var. longifolia, dotted the roadside all the way, as it does in reality all through the State. The Genista tinctoria grew all around in the underbrush. "Is there any better argument to prove the descent of the first families of Virginia from a high and titled ancestry than the presence of this little Leguminosa? Did not the descendents of Plantagenet carefully import its pods to this country of their adoption, when their great dynasty was swept out of England by a newer broom than that made from the Planta-Genista of Anjou. What an aristocracy when even the weeds proclaim princely descent!

But the coachman asks, "will you look at the grave now or as you come back?" "There stood a square inclosure with brick wall surrounding, save a few feet of iron railing at the front, and an iron gate of entrance at the side. We entered this family grave-yard, to visit one sacred spot marked by a plain granite monument, about eight feet in height on whose southern face tradition tells of a marble tablet whose inscription prepared by the hand of Jefferson, recorded those deeds which he considered the worthiest of recollection.

"HERE LIES BURIED

THOMAS JEFFERSON,

AUTHOR OF THE DECLARATION OF INDEPENDENCE;

OF THE STATUTE OF VIRGINIA FOR RELIGIOUS FREEDOM;

AND FATHER OF THE UNIVERSITY OF VIRGINIA."

This tablet has been removed in order to preserve it from the destruction of vandals who have nicked and notched the hard granite and so broken the family slabs as to make the inscription fragmentary, Gathering some Vinca that crept along the wall and a few wild flowers as mementoes of this neglected sleeping place, we resumed our visit to the home of Jefferson. A frail fence leaning now this way, now that as though uncertain how to fall, its great gaps patched up with ochre painted and jagged strips of sheet-iron or tin, blown probably from some ragged roof, marks the lane of entrance. A ruined chimney stands sentinel and tries in vain to conceal its nakedness by enveloping itself in a mantle of Ampelopsis. A few bars occupy the place of a gate and piles of bricks and stones are sad remnants of the workshops of mechanics and the homes of laborers and house servants—slaves of an indulgent and prodigal master. The mansion is of a dark brick in the form of a cross, two stories high, and surmounted with a dome. Its location is fine beyond all description. We gladly pay the very moderate fee, and enter, conducted by an aged and almost toothless porter, who answers with southern frankness our expressed desire to see everything of interest—"there is not much to see, all the furniture has been taken away." We found much of interest, but the Club must not be wearied with a narrative of what is within—a narrative not pertaining to natural science, save as the spiders were busy in a few eligible nooks, where they might hope to catch their prey. We, indeed, passed slowly under the tall portico—admired the large French clock, whose Janus-like face looked outward on the park and inward on the vestibule—examined the polished floors of vestibule and parlors, floors of parquetterie, the work of foreign hands; rejoiced in the lofty and well-lighted dining rooms, and mounted the dark and narrow stairway leading to bedrooms and the octagon dome-crowned ball room. Oh! for one short hour we might behold the scenes of fifty years ago—look upon the face of the handsome and hospitable Jefferson! The Club might group upon the decaying roof, but trust not to the rickety balustrade that seems to guard the unwary footstep. There rose the old flagstaff, and just behind it the little belfry. Gay was the time when the stars and stripes waved in the mountain breeze. and the joyous bell pealed forth its summons to ball, to dinner, or to drive. No wonder Jefferson loved this spot; no wonder so many pilgrims wandered to this shrine. What a magnificent panorama from the house top! What grand trees stand sheltering near; the trees of his choice, who being dead yet speaketh through these survivors of his love of the beautiful. The Acacia Julibrassin, alike elegant in its delicate foliage and its exquisite rose-colored blossoms stretches lovingly over the eastern, while a genuine buckeye spreads a deep rich shadow o'er the western wing. At our feet lies the velvety park with its avenue of locusts, carefully arranged so as to afford both shade and a fine perspective to the far-reaching landscape—the fertile valley of the Ravanna and the distant Blue-ridge stretching northward to Harper's Ferry. At the foot of the hill the spires and glittering windows of Charlottesville are gracefully clustered, and a little further west the object dearest to the heart of Jefferson, his foster-child, the University of Virginia. The mind is delighted with the beauty and overwhelmed with the grandeur of the view. But the gorgeous west and the declining sun warn us that the time of our departure is at hand. With longing eyes we gaze again and again before we leave this glorious look-out. More gloomy and desolate seem the darkened chambers as we descend. We pause before an interesting relic—a chair invented by the ingenious Jefferson—a chair to serve alike for his out-door and in-door pleasure. A moment sufficed to hang it upon wheels when he prepared for the drive, a moment, when the drive was over, sufficed to transform it into an ample rocking-chair. As the infirmities of old age drew on and paralysis rendered Jefferson dependent on the ministrations of others, the man of four score had his chair mounted on wheels and drawn by his servant over his charming parks, under his beloved trees and still enjoyed the glorious works of his Creator. His prayer was granted, that he might see the fiftieth anniversary of the nation, and on that day he closed his eyes in death. The tabernacle of his body has been taken down, the home of many years is deserted and decayed, these yield to the laws which govern the material world, but the principles of religious, civil and intellectual liberty, and of equal rights declared and defended by Jefferson live on and his name is identified with immortal truths ,over which the hand of time has no power for evil."

Thus has our gifted member told the story of Monticello. My duty in this report is only to sift the ashes from our yearly work and to bring here for our entertainment the bright and glowing coals to kindle a fire whose warmth and light may not soon go out.

"If it were possible to weave into the details of science the glory of a mountain sun-rise, the wondrous experience of a twilight view from Hawk's Nest, the crossing of the swollen torrent of Greenbriar River in a scow by moonlight, the before unimagined sublimity of the Look-out Mountain prospect, the darkness and silent grandeur of Mammoth Cave, and the majestic glory of a total eclipse," as all these grand revelations of nature were enjoyed by our friends in the South, my report would become interesting. But the heart's deep emotions may not be thus uttered, they remain as a part of our soul's possessions, rich but voiceless, and more eloquent than words could be.

Extensive travel gives opportunity to observe the geographical distribution of certain plants. Last year we had reported the fact that Geranium maculatum bloomed all over the wide region visited by our members. This year but little mention is made of it, only to note its absence. But the pretty Ruellia Strepens takes the place of Geranium and blooms all over the land. A member suggests that certain wide-spread plants may take their turns through the years in blossoming abundantly. "Now, one troops forth blushing and blooming most profusely in the valley and on the hill-top—it is the Geranium year. Next season Geranium retires in the back-ground, and Ruellia or some other appears in force."

As our experience widens in the domain of natural science, we come to see many things not understood before. Gifted with an emotional insight into the natural world almost prophetic, the Greeks peopled the woods with Dryads, and their singing brooks mingled their wild voices with the laugh of Naiads, thus linking the outer world with our finer human sympathies. We can understand how the majesty and beauty of the trees on the southern mountains, the Magnolias, the Liquidambars, with their starry leaves and pendent pericarps swaying in the breeze, and the chestnuts all in blossom, their cream-colored tops bathed in golden morning light, their base yet hidden in the robes of retreating dawn, moved our friend to say to them as the stage rolled on: "good-bye beautiful trees."

The Oxydendron arboreum is represented as casting its shade over the wild road winding up Gauley Mountain, making beautiful a landscape where, in war times, thousands had encamped for months. In other places, the snow-drop tree, Halesia tetraptera, in fruit, hung its graceful branches over the road. The white flowers often cover the ground like snow; each blossom a little bell, dropping from slender pedicels in the "early days of May."

Let us go now in imagination to the brink of the dizzy precipice of "Hawk's Nest." We look down into New River, as it flows twelve hundred feet below us. "So nearly perpendicular is the rocky pillar on which we stand, that it is said to be impossible to cast pebbles thence into the stream, they invariably alight on the farther shore. The meanderings of New River for several miles above and below our stand-point, are distinctly visible, giving to the wondrous picture *breadth* as well as depth. As, in breathless silence we scan the sky, the mountain sides, the walls of bare-rocks, the foaming torrent, vainly striving to take it all in, the weird shadows of coming night creep up the gorge, and, as the mists thicken, the landscape is shut out."

On Big Sewell Mountain the scene changes. Viburnums and the wild Hydrangea and the Goat's-beard (Spiræa aruncus) wove themselves into the tangled underbrush. "One solitary heroic Sanguinaria leaf bravely bearing the whole burden of the vigorous subterranean life known to exist below, was discovered. Strange, that nature commits the whole work to a *single* leaf! Why not create more?" From the elevated road on the mountain, *down*, *down* into the wilderness of underbrush, gleaming out of the darkness intensified by their own evergreen foliage, appeared the Rhododendron, burthened with white and rosy blossoms. "For several miles on Little Sewell Mountain, this Rhododendron illumination lasted," these splendid forest chandeliers coming out in greater brilliancy as the dark green foliage thickened around. Azaleas and the wild forest honeysuckle threw delicate fragrance into the stage windows as it descended the mountain.

"During a tedious ascent of Lookout Mountain, the plant most enjoyed was Techoma radicans. It grows in the Tennessee forest with the vigor of a true native. Asserting its cognomen "radicans," it climbs the tallest trees by numerous rootlets and clings to the bark through its entire ascent as closely as does the Rhus toxicodendron with us. At length, from far up in the branches of the trees, it unfurls its orange and scarlet banners in a style inspiriting to behold."

In the South, so early as August 2d, the maple and gum leaves are often brilliant with what we call autumnal colors. "May not this early tinting *there* be received as proof that the brilliant hues are the result of the ripening of the leaf, and not of the devastation of frost?"

The flora around Mammoth Cave, we are informed, is a rich one. "Near the Cave's entrance, within reach of its icy-cold breath, cold in summer, but warm in winter, grew the little Western daisy, the Bellis integrifolia, the only native New-World daisy." Scutellaria saxatilis, Silene regia, Lobelias, Campanulas, Galiums, Sabbatias, Veronicas, Ruellias make glad the solemn entrance to the great cavern. Are we not oppressed with nature's generosity, and awed by her magnificence? Who would care to gaze on the factitious equipage of kings, when the summer forest unfurls its magnificent drapery, sparkling all over with the gems of a thousand flowers? True royalty belongs to him who can fill his soul with perceptions of the beautiful in nature, but it is only patient culture of the *heart*, as well as of the head, that will open the pathway leading to the throne.

The song of the Starling hovering over its wild home, was enjoyed by a member on the beautiful river-hills of the Susquehanna, and the half-human wail of the Whip-poor-will, that unslumbering, complaining insecticide, filled the summer night with shades of sadness.

We have welcomed reports sent to us from the mountain, and from near the sea, from the north and from the south, and from the Middle States joining our common and beloved country.

Let us now ask what the *river* can give us. In the wide world there is bread enough for all, and most know where to find it. In the wide, wide world, perhaps, there is compensation, too, for all hearts, but not always do we find *it*. A hunger greater than that of the stomach, a want not to be purchased in the world's villainous mart, a longing which no human sympathy could gratify, led us to the river. Ten unbroken hours of summer sunshine seemed a fortune not to be realized, but now our time had come, and we would own a day. Not along the dusty roadside, not across brown fields scorched by August's sun, not up wooded hill-sides only to clamber down them again, did we intend to go; but, from shaded bank and quiet cove, from one green oozy bed of water-plants to another bathing their bright limbs beneath the stream, we would glide, not rudely step by step, but gently, as one happy thought succeeds another, we would live these golden summer hours on the river.

A strong push from the shore, sent our light boat into the stream, and a few vigorous pulls at the long oars widened the distance between us and the land, until a broad sheet of glassy water on either side, separated us from all the busy or idle inhabitants of the earth. We were alone, and, at last, fairly afloat. To a solitary man on the river. his boat becomes either his cradle or his friend. No mother's arm can rock more gently than the light wave of the river, and while our boat bears us whither we will, into its arms for the time, we commit the precious or *insignificant* freight of our life and our pleasures. If man had wings how grandly he would soar above all the other tribes of creation. His ambition would outstrip the eagle, or overtake the swallow in its southern flight. More tireless and rapid than the "Frigate bird," he would skim the vast solitudes of the seas, or seek fresh pleasure or plunder among or beyond the rolling summer clouds. He would be in the purple west at sunset, or in the gray east at its earliest rising. Ubiquitous on the land, he marks it with his roads of stone or of iron, but the track of his ship on the water is swept away even as his own remembrance fades from among men.

For the time, our oars were our wings, and they wafted us without taking a step in among countless golden blossoms, sparkling and star-like covering an acre of the broad face of the river, innumerable little traps catching the August sunbeams, lifting their frail and beautiful heads in pleasing contrast only an inch above the deep green branches below the stream. How fresh and youthful and full of life were these delicate flowers, sleeping there in the fierce sunshine, neither scorched by the heat nor drowned in the wave—their home between the hot sun, darting invisible arrows of life from above, and the cool water sending up through thread-like tubes equal currents of life from below. The flowers of the water-star-grass, though more frail and minute than the water-lilies, take equal rank with them in beauty, and we preserve these two golden and silver gifts of the river on the same white page in memory's herbarium. Every plant that we pluck from the earth or cull from the river should be to us a flower transplanted to the garden of the soul, there to bloom forever, shedding its perfume of sweet and everlasting remembrance.

We drove our boat beneath two high bridges that spread out their wide arches from massive buttresses standing in the river, and just in time to have a train of cars pass directly over head. People seek new sensations on the mountain and on the sea, and they chase the same phantoms through all the ordinary walks of life, but it is not often we throw ourselves beneath the wheels of passing trains, for impressions thus obtained, have been, often, overpowering. However, we had faith in our boat, and perhaps in the bridge, but had the irom mass crashed through into the river, one flap of our long wings, bird-like, would have sent us beyond harm. It is said the triangular stem of the paper-reed, which stands erect in the rapid tide of the Jordan river, gave a hint as to the best method of making buttresses to bridges. These reeds, though frail enough for a child to bend, present sharp angles to the stream, and stand securely while much stronger plants are prostrated by the current.

Our boat now drifted along the river's margin where shadows fell on its clear surface with a will of its own, and our long wings lay folded by its side. How charming is this summer idleness, thus floating on the river, and we drank of its compensations with more than a childish delight. To glide along by lazy inches over the polished liquid surface, without effort of nerve or muscle, the will profoundly asleep, but every sense enough awake to be exactly balanced—floating on the ebb-tide of being, without conscious expenditure of nerve force, the empty ear roams along the wooded hill-sides for song of bird or insect hum, or strays farther away towards the abodes of toiling, busy men, and catches the shrill whistle of his engines that drive his dusty commerce over the land; the eye travels the deep blue of the sky for changing cloud or happy bird; the moist breath of the river brings its fragrance to soothe and to repay, while general sensation opens a thousand pores of feeling, and a touch more sensitive than the velvet fingers of thought, comes from the glad summer air, flooding the whole being with physical and mental delight. We bless the summer for its generous gifts; we bless the river, as did the Egyptians of old, for its many and helpful compensations.

"The quiet August moon is come;
  A slumberous silence fills the sky,
The fields are still, the woods are dumb,
  In glassy sleep the waters lie.

Oh! how unlike the merry hours
  In sunny June, when earth laughs out,
When the fresh winds make love to flowers;
  And woodlands sing and waters shout.

When in the grass sweet waters talk,
  And strains of tiny music swell
From every moss-cup of the rock,
  From every nameless blossom's bell.

But now, a joy too deep for sound,
  A peace no other season knows;
Hushes the heavens and wraps the ground—
  The blessing of supreme repose.

Away! I will not be to day,
  The only slave of toil and care;
Away! from desk and dust away,
  I'll be as idle as the air."

To us, water has ever been the emblem of immortal youth and beauty. The brown earth; the rugged mountain rocks; the proud and mighty forest; the cedars of Lebanon and the pines of California: all the tombs that man can dig in the earth's concealing bosom; his monuments; his own proud head; and, alas! the lovelier brow of woman—all these are marked by Time's grey pencil. *Only his tears*, not his works, escape the wrinkles of age. Tears only bind him to the fountains of everlasting youth. Water never grows old. The Nile looks as youthful to-day as when its waves rocked the infant Moses among its rushes. The cool drops now trickling from the forest spring are neither older nor younger than the salt spray caught from the crest of the wild wave of the sea. Who ever thinks of the land as young? In our remembrances of water we never associate the idea of age.

We gazed over the side of our boat into the dreamy water with a longing not easily defined or satisfied. We saw :—

"Sent up, rock, sand and wood,
Life, joy and motion from the sleeping flood."

The mingling stems of water-plants wove a green carpet over the bottom of the river, while Anacharis and Vallisner trailed their green ribbons in the sluggish current. We saw only old friends in the river, but those old friends seemed to speak to us like voices coming from the days of our childhood. Man's richest life lies in his remembrances of the past; the present is an intangible myth, forever lengthening out its glad or regretful shadows toward the morning of life; our *hopes* only reach out into the unknown future, to build us a home whose light shall not go out.

In the still river, we saw—

"Reflected rock and tree,
Each leaf at rest or quivering in the air;
Now rests, now stirs, as if a breeze were there
Sweeping the crystal depths. How peaceful all!
And see those slender top-boughs rise and fall;
Above; below, each grain distinct and bright:—
Thou bird that seek'st thy food upon that bough,
Peck not alone; that bird below, as thou
Is busy after food, and happy, too;—
They're gone! Both pleased, away together flew."

Myriads of little people, too, live down in the cool river. We bared our arm to the shoulder and thrust it into the flood, down among the shaded homes of our acquaintances, the Melicertas, the Polypes, the Lymnæus, the Brachionus, the Stephanoceros, and the beautiful Floscularians, but they eluded our touch, yet we knew they were there, filling the cool grottoes of the river with life and beauty. The sun-like Actinophreys studded the bright leaves of the water-plants, and shot out its pale rays in microscopic imitation of the sun overhead. Anchored to the rocks the graceful Urnatella—a hydroid Polype—reared urn on urn in its upward growth, and flung its circling tentacula out for food. Flashing cog-wheels and endless chain-motions driven by muscles a thousand times more delicate than a hair,—types of a life that never slumbers—spin out their invisible cycles on the rich flora of the river; a population outnumbering by millions all the visible tribes on the surface of the earth.

Thickly growing pond-weeds, the water nymph (Nais flexilis) and the Vallisneria spiralis gave the water a twilight obscurity without at all interfering with vision. Oh! the richness of the fauna and the flora of the river! born and cradled in the ever-youthful and life giving water we had learned your lovely forms in the days that are past, but still the recollection of your unspeakable beauty comes welling up from the river, like the glad water of some crystal spring whose source is hidden by the weedy bottom. You *have* given compensation for that deep but indefinite longing which drew our eyes over the side of our boat; you filled our craving soul with a worshipful sense of that omnipresent life which encircles the earth and fills the waters. Yes, life is the captain of this microscopic navy of the river and we must believe that a perfect order governs every little craft. The wheels that hum in the busy factories of men—the sewers that drain his cities—the bricks and marble that build his beautiful homes—the crystal glass that lets God's glorious light into his dwellings—the ropes that hold erect the masts of his ships in storm, or spread the white sails to the summer breeze—his terrible engines of Christain warfare—those ponderous iron jaws that open and shut on the cold metal in his foundries—*all* remind us of portions of your bodies.

Man claims to be the inventing animal, perhaps he is only unconsciously copying types and forms which live or sleep in the boundless abodes of the present or sealed tombs of the past, and whose likeness he can reproduce because of his proud inheritance as lord of *all* the tribes. Surely along the paths of life somewhere lie foreshadows of all we know, or do, or need; the ages that have past away still speak to us; the present is robbed of its richest teachings only by indifference or doubt; and all the innumerable years of the future hold no hope nor promise but its shadow has fallen somewhere across the horizon of this life.

But we must lift the heavy anchor of our eyes from the bottom of the river, and spread out our long wings again for the bright surface stretches out far, far ahead. How sweetly the river kisses the flags and the tall reeds standing in the cool water.

Louis the VII. adopted the Iris (the Fleur de Lis) as his heraldic emblem when he sat out on the Crusade, and it is still the flower of France. Acres of Vallisneria, surrounded our boat with its translucent leaves. This plant is truly the gem of the river. It is called wild celery, and the ducks fatten on it in the bay, and their flesh is rendered quite aromatic by eating this plant.

We drove the prow of our boat on the sandy beach of an island in the river. Its vegetation was insignificant, looking parched by the hot sun, and contrasting widely with the freshness of the river. Little boys from the neighboring shores row over to this island to get elder berries to put in the family whiskey for their fathers and mothers to drink in the winter time. Let it be so. Still farther up the sleepy river our long wings bore us, until we saw the white monuments of Laurel Hill rising, Oh! so thickly among the trees. The burning baptisms poured from the full urn of human sorrow, have rendered many places dear and famous, and the genius of a few tears is silently embalming the only spots on earth we can long to remember. Our cemeteries and our battle-fields live longest in recollection. Perhaps, when other views are held by the Christian world, in regard to death this may not be the case. "To have laid a strong affection down among the dead may be a great sorrow, but it is not a real misfortune. Whatever one's after goings may be, *there* is a deposit for the future life, a stake in the better country, a part of the heart which the grave keeps holy, in spite of the evil that is in the world. The living may change to us, or we to them, sin may divide, strife may come between, but through all times and fortunes the dead remain the same to our memories and loves. The early lost friend is still the blessed of our youth, a hope not to be withered, a promise not be broken, a possession wherein there is no disappointment."

Other bridges now threw their wide arches over the river, one to carry the rattling cars laden with coal for the distant city; the other to transport carriages and pedestrians from shore to shore. Rocks, too, lifted their brown heads from the river, and a flock of white geese were feeding in among the wild celery plants. Oh! how beautiful is everything on the river! here, as on the land, beauty is the rule, deformity the exception. To know and to *feel* all this, to have *all day long* the delightful sense of the *personality* of the river, and to feel at every dip of the oar, how like the current of *our own* life was the river, all these compensations, and more had satisfied that longing so felt in the day's earlier hours. The waters we were now in, were defiled by impurities washed in from its banks; a thousand little but poisonous rills coming from the busy hives of human labor, mingled with the clear water of the river, but its concealing current took them all up in its embrace, and bore them onward, still deepening and widening like the current of human life widens and deepens until both alike deposit or leave behind the defilements of their youth. If we would enjoy the full sense of freedom, go on the river, no hills to climb, no gates or doors there bar our progress, no intricate and strange streets filled with iron men and women, no one to speak *at* you, you skim from shore to shore, touch land or rock or grassy beach just as a wild fancy leads you. Oh, that *is* liberty!

We were guiding our boat towards a bubbling spring that sparkled among the rocks shaded by willow trees. How grateful was one long and hearty kiss from its wet lips. "The tepid river may float our boat, but we quench *our thirst* only from the hidden waters of the little spring." Out on the river, in a boat anchored by a rock not more motionless than himself, sat a man, or, at least, what resembled one. He was fishing. Nothing with feeble life could have endured in silence that blazing sunshine; yet, there sat that bronzed hero of endurance for an hour, gazing with hope at a small piece of wood sleeping on the water. But, perhaps, his compensation was as great as our own. He came to the river for what it could give *him;* we, too, came, and found no more.

The sharp keel of our boat now ploughed the soft bosom of the river on its homeward path, and the gurgling water tickled its lazy sides with a sound like that made by a dog while drinking. The tall forest trees along the banks had forgotten the freshness and the greenness of June, and now, summer and the young autumn mingled their sadder drapery among all the branches.

The yellow leaves of the poplars already looked towards the earth as if selecting tombs to lie in. No marble will lift its white finger towards the sky, not many tears will damp the spots where sleep the dead leaves of the forest, but nature will rear from their ashes monuments that will fill men's hearts with health and gladness. In shady spots along the river, happy children played in the water, and cast stones far out into the stream, rejoicing at the splash and circling wavelets sent back by the river.

We were now returning home. We always enjoy these returnings home because of *what they foretell.* They nourish a hope we all hold sacred; they let fall a few drops of life giving water on the fondest longing of the soul. Returning home! How the thought reaches out in anticipation over the deep waters of that river along whose resistless current we shall one day sail towards our final home. And, if the track of our boat shall then be marked only with bubbles, perhaps, some friendly hand will come and let fall a pebble into the river, for these little wavelets sometimes help to waft us into port.

Several of our Club meetings have been given to the Cryptogams, and, we must not forget our work in that department. Some of our members will recollect the swarming of the zoospores from the mature cell of Vaucheria. This wonderful event in plant life is as rare to the general lover of our science as it is curious. Many botanists of distinction have never seen it at all. The protoplasm of the mother cell breaks up into numerous masses which gradually assume definite oval shapes, then all commence a crowding, jostling motion towards the free end of the cell, until they all burst through the apex and swim freely about in the surrounding water, each zoospore driven by cilia attached to one end. This, and many other deeply interesting phenomena of life, in plants and animals, profoundly hidden from many others, our microscopes have rendered familiar to us, giving wider perceptions of the glory of a Creator, and deeper insight into the beautiful world we inhabit.

In the mosses and liverworts and equisetums, the lycopods and selaginellas, we have traced their life history from the germinating spore, in a general way, up to the mature plant, so that work in this interesting department hereafter will not be difficult. Properly prepared natural illustrations of the various parts of these natural orders, have contributed, perhaps, to a clearer understanding of their minute structure; indeed, without such help as the miscroscope brings, conjoined with illustrative preparations, it is impossible to progress in cryptogamic studies. In order, therefore, to enable our members to work their own way along among the cryptogams, and also, to reveal to best advantage and to preserve for scientific study the delicate parts and organs of all plants, I will detail some processes that have been measurably successful in my hands. Not one of us can tell in what chamber of nature's great temple we may yet have to work; and, teachers especially, should be prepared to give their pupils, at least, some of those processes essential to original research in botanical pursuits.

To separate the tissues of a plant with as little change as possible in the cell-structure is, perhaps, the first want of the anatomical botanist. Prolonged maceration in water is too slow a process. Place the specimen, therefore, (a leaf for example), in a test-tube containing nitric acid with equal parts of water, and boil *very* carefully. If the leaf is very delicate, a heat less than the boiling temperature will be sufficient; if dense, a longer time will be required. Very soon, the preparation will become yellow from the action of the acid, then decant it into cold water. If the boiling has been arrested at the right point, and nothing but practice will teach this, the epidermis, spiral tissues, parenchyma, wood-cells, or any other special part may be isolated while in the water without difficulty. The acid, when used as I have indicated, becomes a keener dissector than the knife or needles, and it loosens the connection between the cells, without materially changing their form, except a coagulating action on the protoplasm which is unavoidable. It often is advisable to return the preparation to a test tube, and again boil in alcohol in order to expel the acid; after which, wash off again in water, and the specimen is ready for examination or further dissection. The parts of plants thus prepared, have a clearness and distincness of structure not to be observed in the natural state. Again, it is desirable, in some instances, to render the specimen we wish to examine sufficiently transparent to enable its structure to be seen without dissection or disturbance of its *natural relationship* of parts. To accomplish this, (let us retain the leaf for illustration,) it will be necessary to get rid of all coloring matter. Allow it to soak in water having a little chlorate of potash and a few drops of hydrochloric acid in solution until the preparation becomes almost white. Only a few hours are necessary to obtain this result, then wash off in clean water, and deposit the specimen in water to which a few drops of caustic potash in solution has been added. A little heat will hasten the changes. A brown color first appears if enough potash has been added, but this all disappears after the preparation has been returned to clean water and *gently* washed. Sometimes, at this stage of our work, it is best to boil carefully in alcohol in order to remove all traces of the potash. Now examine the leaf under the *binocular* microscope, and, if the process has been properly followed, it will be nearly as transparent as glass, thus giving an opportunity of looking right through *all* the tissues while they remain connected with all their natural relationship of parts, and with *less change* of structure than results from any other treatment. Quite good results are obtained, in some instances, as in the mosses and other cryptogams, by heating them in a test tube with water and glycerine, equal parts of each, this expels all the air, retains much of their beautiful colors. and is a *rapid* method by which to render such object transparent enough for study. But, I prefer placing the preparation in water, to which carbolic acid has been added, in the proportion of sixteen drops to the ounce of water, and then heating in a test tube. If the specimen is to be preserved finally in glycerine, then boil in glycerine and water; but, if a watery medium for preservation is intended, the carbolic acid treatment is best. A little practice will render most persons expert, and the processes may be varied with advantage in order to obtain special results. Of course, the natural green color is lost when nitric acid is employed to separate the tissues, but we may restore greenness of color again. Obtain at any photographic or color store, a little bottle of "Worden & Co's" aniline green; soak your preparation in it for forty-eight hours, and the leaf-green comes back again. The intensity of the green color thus restored, will depend upon the time consumed in the process. If a long time be allowed, the color becomes deepest; but, if the preparation becomes too deeply dyed, by soaking it a minute or two in alcohol the proper shade may be procured. This remark will apply to all aniline colors employed in staining vegetable tissues. A watery solution of acetate of aniline, to be obtained at the shops, will enable us to demonstrate the most delicate cell walls or nuclei, or spiral tissues; indeed, without these or equivalent staining processes with carmine or logwood, we may easily overlook structures otherwise too diaphanous to arrest light enough to become visible under the microscope. Having, in this way, obtained our specimen in proper condition, we may desire to preserve it in a state best suited for scientific study. It is a delusion to suppose that any *very* delicate cell structure can be preserved through time absolutely unchanged. When the spark of life takes its flight, whither we know not, all highly organized and delicate tissues suffer changes which art cannot prevent nor entirely conceal from the practiced observer. Therefore, our best efforts are only approximative. The carbolic acid solution I have already indicated, sixteen drops to the ounce of water, is the best medium to preserve vegetable structures. I have not time to detail the mechanical steps necessary to this work that may be found in the books. My object is to place before the Club a record of practical experience not to be obtained elsewhere, and which, if followed out, will enable each member to equal the best results obtained here or in Europe. Nearly all the microscopic preparations in the British Museum made by John Hunter, as well as a large part of those put up in *cells* containing *watery* media, elsewhere, are spoiling because no reliable cement could be found. Hence, discouragement and disappointment stood in the way of progress; or, many investigators employed only balsam as a preservative. But, balsam is wholly inadmissable for the *fine* work of the vegetable anatomist. A preserving medium with an index of refraction nearest that of water is best, and such is the carbolic acid solution.

Take now, Canada balsam rendered hard by evaporation in a sand bath or otherwise, and dissolve it in chloroform to the consistence of thin syrup, add a little oxide of zinc ground *extremely fine*, until the mixture becomes about as thick as cream; then add enough oil of turpentine to prevent the too rapid drying of the cement on the brush while it is being applied, and we will have a material which excells *all* other cements for our purpose that have ever been in use.

It dries quickly, adheres under *all* circumstances, retains a polish equal to porcelain, does not leak, and really answers the purpose for which it was made.

The thorough student in natural science must, himself, dissect and *preserve* the objects of his study; and, if these few practical *hints* will benefit the Club, or render easier or more certain our work among the plants, your pardon will be granted for the narration.

In concluding my report allow me to say, I am sensible that much of our work through the year, has been omitted. The departments of Ornithology and Entomology alone, would have employed us for the evening. But, I preferred to go in a general way, over the whole ground, permitting the train of thought to be guided by suggestions made in the Club, and seeking only to awaken pleasant memories which may endure long after those of an opposite character shall be forgotten.

THIRD ANNUAL REPORT

OF THE

Natural History Club of Philadelphia.

PUBLISHED BY ORDER OF THE CLUB.

JANUARY, 1871.

PHILADELPHIA:
COLLINS, PRINTER, 705 JAYNE STREET.
1871.

THIRD ANNUAL REPORT

OF THE

NATURAL HISTORY CLUB OF PHILADELPHIA.

DECEMBER 22, 1870.

THIS day the members of the Natural History Club of Philadelphia meet to celebrate its third birthday—meet with happy memories of the past, as they recall the experiences of 1870. Claiming no height of scientific attainment, no depth of philosophic research, they have made no brilliant discoveries; they should blush at the mere suspicion of having raised such an expectation.

With a single purpose and a simple creed, this little band of friends is held together by common tastes and common sympathies. Recognizing the Father in Heaven as the Creator of this round world and all the inhabitants thereof; and impressed with the sublime words of the Mosaic narration: "And God saw everything that He had made, and behold, it was very good"—they believe it to be a privilege to sit together and talk over His wondrous works. The Father has presented to them, as to His other children, His Book of Nature, all rich with original designs, and full of illustrations; with a child-like spirit they accept the gift, and are trying to spell out the golden text which describes the fascinating objects pictured on the glowing pages, whilst the gracious loving Father smiles on every reverent effort to understand the glories of His handiwork. If they have not made much progress in spelling out the text, they have found in each other's conversation and companionship a joy which no solitary studies can furnish. But, alas! the magic charm of conversation is soon dispelled. To preserve in a less perishable form whatever the special tastes or the individual observations of the members might supply for the common good, it was agreed that each in turn should prepare a written essay on some theme connected with the study of Nature, that should serve as the principal subject of conversation at each reunion. These, as well as the Reports made by absent members, were accompanied with illustrative specimens of plants, flowers, fruits, insects, birds and minerals referred to in the text. These, with other objects of interest, were spread upon the ample board round which the Club gathered from week to week, and were passed from hand to hand for close individual inspection. Texas sent its huge spider, the brown and hairy Tarantula; Alaska, the curious nest of the Crab or Trapdoor spider (Mygale cœmentaria). The outside surface of the door to the underground mansion of the burrowing spider is covered with earth, and shuts so closely down upon its doorframe, the orifice of the nest, as easily to escape observation. Swinging on a perfect hinge, it is opened or held down firmly at the spider's option. The door is circular, with a convex inner surface, neatly lined with a gray silken covering, and its edge, reaching from hinge to hinge, bevelled with exquisite skill. This first Alaskan door opened to the Club awakened the desire to make "one little excursion" to the northwestern borders, and find our Alaska fellow-citizen at home. The Woodpecker (Picus pileatus L.) allowed us to examine his tongue; the swift Lizard (Agama undulata) his tiny slender fingers; and the Devil's Coach-horse (Reduvius novenarius), one of the most useful residents of Washington City, was duly honored as the destroyer of many insects injurious to shade trees. California showed her gigantic pine cone measuring eighteen inches (Pinus Lambertiana), dwarfing by contrast the large cone, that stood by its side, of the Pinus pinea, from Southern Italy. The rough-cased Geode was broken open to disclose its sparkling quartz-crystals within; and the cases of the Caddis-worm of the brook displayed the architectural skill of the work-worm. From the length and breadth of the United States, and from the trans-Atlantic Alps, came specimens too numerous to mention.

Owing to the unwonted mildness of last winter, the hardier flowers of Philadelphia bloomed probably through every month. Golden dandelions gladdened the green fields, and so early as the 6th of January the Symplocarpus fœtidus, with its inclosed flowers shedding the pollen upon the glossy, striped purple "shell," appeared as "the harbinger of spring" when mid-winter should have reigned; the next month brought the blossoms of silver maple to adorn the table where usually stood only ferns, mosses and lichens. The chief enjoyment, however, during the winter, consisted in making border raids upon the vast and still unexplored territory of microscopic life. Many organisms, animal and vegetable, the living and the dead, were questioned in the cause of truth, and one of the Club was almost frightened when the bee's dissected tongue testified, under cross-examination, that its possessor did not lap his nectar with a licking tongue, as the books had misrepresented; that his tongue is not a solid cylinder, but a delicate tube inclosing a filamentous organ whereby he gathers up his honeyed sweets. Subsequent to this observation, mention was found, in a book published by Samuelson, that the lingula is not solid, but a tube with inclosed organ. It was gratifying to find this corroborative testimony of a foreign microscopist; but as these observations, American and English, were quite independent, the palm of discovery must be awarded to both observers. Not only the tongue, but the plates between which the wax is secreted—the poison-bag, and its connection with the convoluted poison-gland—as well as the hooklets on the edges of the transparent wings, whereby they may be temporarily united, were studied. The Gammarus, a little crustacean, found in hydrant-water, showed how his blood circulated, the movement of the globules in the *large* dorsal vessel being particularly distinct. Another tiny inhabitant of the water (name unknown) had his head, jaws, and portion of the body covered with clinging groups of parasites. Did he not feel himself a "big-bug" in comparison with these insignificant creatures that clustered around him, and lived upon his greatness? Man and his parasites have their analogues in these humbler types, and the votaries of natural science find not only material facts, but also quaint illustrations of manners, and quiet lessons of practical wisdom for guidance in the conduct of everyday life. An unknown but delicate Fungus grew upon the fern shade of one of the Club; the mycelium was examined, and later the spores were observable. These being caused to germinate, produced a septate mycelium, resembling the Bread Mould (Mucor mucedo). Some months previous a piece of bread had been placed in the fern case in order to obtain mould for examination. May not this throw light on the origin of the fungus? The fungus found upon the leaves of the oak, poetically called "The Tear of the Oak," when magnified, reveals a curious structure. From a common centre radiate minute black and glossy spines simulating little stars. There is no time to dwell upon the repeated examination of the tiny organs of the mosses, the cellular tissues, the germinating spores of ferns, the moulds or the arrangement of leaf-stomata; only space for a short notice of a dust shower that fell in Vermont February 12, 1870, extending over a district of fifteen or twenty miles. A small quantity of this dust was examined by one of the Club, who detected, among much granular amorphous matter, and fragments of vegetable cells too imperfect for identification:—

1. Many round or oval granules quite transparent, disappearing when treated with nitric acid.
2. Spores of fungi or Gonidia of some lichen.
3. Diatomes.
4. Cells from coniferous wood, genus Pinus, having their peculiar deposits absent in spots; cells terminating *obliquely*.
5. Other cells of coniferous wood with smaller markings, five in a row and two parallel rows in each cell; the cells terminating *transversely*.
6. Many cells of Algæ resembling Red Snow; these red cells were in the stage of binary division peculiar to that Alga.

The dust is probably the ashes of some burnt forest, sifting the higher regions of the atmosphere, and gathering in transit some recognized organisms and others that could not be identified. There are well-authenticated accounts of dust showers which have deposited matter that must have been borne through the air hundreds of miles.

A small colony of aquatic Polyzoa, brought from a sluggish stream and placed in a glass jar of clear water, furnished a spectacle of surpassing beauty. This little polyp, the Pectinatella magnifica, about a line in length, is quite rare and local, and inhabits a transparent case from the end of which he protrudes when feeding. About sixty tentacula, arranged in two rows along the margin of a membrane shaped like a horse-shoe, surround the mouth. Each tentaculum is lined with hair-like filaments that lash the water into ceaseless motion and bring the food to the polyp's mouth. These cilia have a selecting power, and quickly hurl back into the sweeping tide whatever morsels unfit for nutrition the circling current may bring, whilst their million fingers grasp the fragment pronounced "good for food." Every motion of swallowing can be seen. Down it goes, in under the epiglottis into the ciliated œsophagus, down still into a stomach, until it arrives at a sharp curve in the body of the animal; here a strong peristaltic contraction takes place, but little valves close up the passage down which the morsel has descended, and is driven along the curved tube into another stomach, when its further digestion is quickly completed. The animal has no lungs nor bloodvessel, but respires by means of the oxygen in the water. Red blood globules, associated with pulmonary respiration, are not found in the polyp's blood, though it is rich in organizable protoplasm, which, in innumerable granules, is detected floating in its body. Our all-searching lenses show that even in human blood (which the books tell us is composed of a clear liquid having in it great numbers of red globules) that clear liquid is loaded with protoplasmic granules analogous to those in the blood of the polyp. Muscular filaments, clear as glass, expand and contract with all the inexpressible poetry of motion, drawing the animal out from its case to obtain food, or retracting it to avoid danger; filling the mind of the beholder with thoughtful admiration of their amazing delicacy and perfect functional adaptation. The reproduction is chiefly by budding, a singular link of connection with the vegetable kingdom, though doubtless another process occurs during the life history of the animal. Some of the gemmæ or ova escape from the parent through an aperture near the tentacular crown, rise to the surface of the water, and become attached to sticks or to other bodies. No words can convey an adequate idea of their very beautiful structure. The centre of each ovum is circular and of a clear golden color; its surface, marked with regular hexagonal lines, suggests a microscopical honeycomb. This centre piece is surrounded by a broad rim of faintest chocolate color; and delicate six-sided prisms, with their ends resting on the central portion, make up the rim. At the period of hatching, the egg opens around the margin of the rim and divides into two equal but unlike parts where the young polyp, not larger than a pin's head, with its tentacula all spread, is seen cradled between the protecting valves of the egg, that still adhere like ample shields to protect the new life from harm. The Pectinatella seems to need no sleep. Watched in the quiet night as well as in the day, it was always in motion. Nor is this strange, for the human medulla oblongata never sleeps. These and other facts, gleaned from a few days' study of the humble polyp, have brought their rich reward. They are revelations of the unwritten "annals of God," full of deep instruction, and promising greater and other compensations beyond.

Quite a variety of themes were discussed in the essays whose summary is here reported. The Locomotion of Insects, sweeping a large field, was followed by a monograph on the Cedar apple. This fungus (Podisoma macropis) is a vegetable parasite with mycelium growing under the bark of the cedar on which it subsists; of rounded form and brownish color, it is often unnoticed in dry weather. In damp weather it resembles, from a distance, a gaudy, orange-colored flower amidst the green foliage, for out of the openings distributed over its surface protrude conical orange-colored growths, from one to two inches in length, and of gelatinous consistence. If one of these strings be laid on a glass slide it throws out roundish or ovoid spores. These being observed at some distance from their source on either side, the existence of elaters seems probable. Besides these spores, pairs of conical bodies, probably sporangia, are found in the gelatinous mass. These are larger than the spores, often empty, and bearing a fibre of considerable length.

A third essay, treating of the Rose family, beginning with its type, the indigenous rose, the subject of poetry and song, presented the fragrant-leaved sweetbrier, the delicate flowered spiræas, the hardy hawthorns, and our large fruit-trees, the glory of our orchards. Beauty and usefulness contend for eminence in this family; for the valuable fruits of apple, cherry, plum, peach and quince, the fruits of strawberry, raspberry and blackberry succeed blossoms that make our spring landscapes like fairy land. A great variety of fruits is also characteristic of this family, as illustrated in the pome, the drupe, simple and compound, the achene, the hip, and the haw.

The essay on Coniferæ, sub-class Gymnospermæ, describes the trees of this class as evergreen, the larch and gingko only excepted. Thirteen genera, comprising all our ornamental as well as our more useful evergreens, with their leading characteristics, their special habitats, and their historic interest, were passed in review. In all time, and among all peoples, evergreens have been selected to adorn the villa, the temple, and the churchyard. They have been carried in funeral processions as typical of immortality, have been offered in sacrifices to the gods, and, even in our own day and land, the adherents of a large church carry sacred green branchlets to their homes on Palm Sunday.

In another essay, "The Coloring of Plants," a subject of great interest, is discussed—the coloring principle of plants found in the cells of the tissue, parenchyma. Its development is dependent upon the action of light, the globules of chlorophyll and chromule existing in a colorless state until acted upon by that agent. The operation of light in coloring the leaves of plants is sometimes exhibited on a grand scale. Over vast forests clouds sometimes spread so as for days to intercept the light of the sun. In one instance, just about the period of vernation, the sun had been clouded for twenty days, during which time the leaves of the trees had reached nearly their full size, but were of a pale or whitish color. One forenoon the sun broke forth in full brightness, which produced so rapid a change in the color of the leaves that by the middle of the afternoon the forest exhibited its usual summer dress. From the bursting of the pale bud, in early spring, until the fall of the leaf a constant change is taking place—from the emerald green through the yellowish tinge of midsummer to the dull or gorgeous colors of the autumn. This change is accounted for by the oxidation of the chlorophyll, but the particular causes at work to produce the various reds, yellows, and browns of our autumn foliage need further investigation. In the flower the chromule exhibits the various tints of the rainbow. Though nature has here lavished her colors, art has produced still other combinations, as in the variegated tulip. The radish, the carrot, the beet are examples of roots growing in the darkness and still possessing much color, and the question arises how to account for its existence? Whatever theory may be accepted, nature decks herself with green as the great groundwork of the vegetable landscape, and of its various tints the eye never wearies.

The ornithological essay described the anatomical structure of Birds, and compared it with that of other vertebrates. The number of vertebræ in the neck varies from ten to twenty-three, the smallest number being greater than is found in the quadruped, and the head is articulated to the neck by a single condyle. Hence the great flexibility of the neck, as well as the ability of the bird to turn its head and look directly back of it without motion of the body. The peculiar locking of the bones of the leg, and a nice arrangement of the muscles reaching from the pelvis to the toes, whereby the weight of the bird bends the toes, enable it to sleep perched upon one foot without exertion or fatigue. As the arrangement into orders is based mainly upon the conformation of the bill and feet, attention was directed to the variations in these parts. The absence of teeth is compensated for by a powerful digestive apparatus, which was described, as were also the organs of respiration. Of the senses, that of touch seems least developed, as the feathery covering may prevent the immediate contact of external objects, and the corneous laminæ or scales of the toes may materially blunt sensation. Hearing and smell are both exercised, though no external ear or nose marks the physiognomy of the bird. Sight, however, is extremely acute, and the powerful eye is carefully guarded not only by two eyelids, but by a third semi-transparent one that can be drawn over the eye like a curtain. In their annual migrations birds are useful in spreading abroad vegetable and animal life. Wild ducks carry spawn into remote waters, and other birds scatter seeds and spread vegetation over an extent of surface else desert. The ordinary flight, as well as the annual migration of birds, has been deemed worthy of study from the earliest times, as affording presages of the coming storm, or a cessation of tempest. At first the elegant barometers and thermometers of the ancients, they soon, by the abuse of the ignorant or the designing, were looked upon as especially gifted prophets, and the college of Augurs, composed of distinguished Romans, taught the people that the flying and singing of birds were indexes of the Divine will in the conducting of human affairs. Of course the Augur alone could interpret, and alone could receive the fee.

Some minds abnormally constituted can find nothing good in worms. The essayist, who presents a monograph of the Caddis worms, writes: "We remember those holy golden days of childhood, when in our own larval condition, we hunted the crawling caddis in the brook that went singing through the meadow. We will go to the book for all the learned sawdust; and to become a bookworm, and *only that*, on all these fresh and inspiring things in the natural world, gives us, of course, a claim to natural relationship, and to call the worm brother. The books say the metamorphosis of this order is either incomplete or complete; we suppose they run no risk in the assertion. The caddis worms have respectable old relations for the most perfect fossil insect, Eugereon Böckingi, as described by Dohm, was found in the Permean formation in Germany." While in the larval condition the caddis is peculiarly defenceless, and, to protect himself from his enemies, builds a case of sticks, leaves, small pebbles or shells, as he finds material at hand. These are glued together by an insoluble cement, excreted from glands just posterior to the under jaw, until the cylindrical case is long enough to contain and conceal his body. A pebble closes the bottom of the case, so fixed as to keep out any attacking foe, and at the same time to allow the current of water necessary to his breathing to pass through and come in contact with the tracheal tubes of extreme minuteness that float fringe-like on either side of his body. Thus the caddis passes the summer days of larval life till there comes a time of change. He eats no more; contracts his horny legs to be thrust from his stony mansion no more; excretes a little more silken cement; makes a strong lattice grating over the open end, and behind this latticed window sleeps in his pupal shroud. Another change and the image bursts forth, tears away with its jaws the silken grating, and, conscious of its rapidly expanding wings, bids farewell to aquatic perils, and basks in the sunny air.

On this anniversary day, too, the Club recalls how the kindly influences of its re-unions enhance the attractions of the recreative trips of the summer holidays, and the gleaners scattered abroad come back with joy to celebrate their harvest-home. Gladly, did time and space permit, would we report the gleanings from Southern Louisiana to Canada North; from the two world-rivers—the burdened Mississippi and the lake-fed St. Lawrence; from the little ponds of Massachusetts and Pennsylvania to the briny waves of the Atlantic and the Gulf of Mexico; from sun-clad, barren peaks of the White Mountains and damp, dark ravines of Watkin's Glen; from Niagara's roar and the deep river-bed waters of Trenton Falls; from desert, sandy islands of New England and from rank, rich swamps of Carolina and Louisiana; from tangled wilderness of the Blue Mountains and the cultivated meadows of Lancaster. Gladly would we ascend with the happy four to the Sappers and Miners' view and gaze upon a panorama embracing four thousand square miles, where the laughing Delaware can be traced for twelve miles as he hurries away to kiss the warm tide near Trenton; gladly stop to rest at Hunter's spring, and, whilst we rest, admire the deep green mosses, the red elder in fruit, contrasting with the almost white flowers of the laurel, and, above all, the glorious rhododendron of the mountain. From the little row-boat, with sixty feet of blue waters beneath, and the cool air rushing through the Gap between the wild wooded mountain peaks, they watch how the declining sun throws golden light on dark hemlocks and glistening oaks; they visit at eventide Eureka falls and Moss grotto, and find Mnium punctatum growing in the cool drip, bearing on each large leaf a drop of crystal water, just as the departing sunlight was refracted through and the dripping grotto sparkled with a thousand tiny lights. From the Gap to Bushkill, a distance of fifteen miles, the road is lined with a succession of landscape pictures, shaded by grand old chestnuts that have stood sentinel for scores of years, till it reaches Shawnee, older than the rival village of Philadelphia. At length Bushkill is reached; Bushkill, with clear golden-brown waters melting into delicate amber, into rich cream color, into foamy white, as it leaps one hundred feet down into its circular basin, shaded by overhanging pines and hemlocks, and lined with mosses and ferns, gladdening to the eyes of the botanist; for here was "a little patch of Circaea alpina, the only spot in which we have seen it in all our rambles." Leaving Big Bushkill Falls, the party made their way over a steep path of loose shale through dense thicket of scrub pine and laurel to "Pond Run." "Unbroken wilderness" gives but faint idea of the wild confusion of mingled rocks and fallen trees, mossy and treacherous, or smooth and slippery, that must be gone over or under, or of tall ferns that hid the ground completely from view. At length the dash of falling waters is heard. It was still high noon, as we stood in twilight shadow directly in front of the cascade, whose waters find short rest in the dark pool below us, after their two leaps of a hundred and thirty feet. During our laborious descent, we learned how sturdily the laurel plants itself on the mountain side, and safely trusted to its friendly aid in our returning path.

Another member of the Club, having visited several little lakes or ponds within a few miles of Delaware Water Gap, remarked that almost every lake has some plant peculiarly its own. On the borders of "Twelve Mile Pond" grew Myriophyllum tenellum; on another, Utricularia purpurea; in the little swamp near, Orontium aquaticum; on the way to the lake, Smilacina trifolia; whilst other plants are common to all. A peculiarity pertaining to Limnanthemum lacunosum, not mentioned in Gray, namely, that the plant occasionally bears tubers adherent to the long petioles of the leaves, was observed. It is, apparently, not a general characteristic. Another party followed up our own Schuylkill to its early home among the hills; then ascended the Catawissa mountains, where the train went winding up and around the heights and over the deep ravine—at one point looking down a distance of one hundred and twenty-eight feet, from the bridge over which they were passing. A ride up Fishing Creek and a sojourn among the hills gave opportunity to enjoy and study the mists, the lights and shades of cloudland. Even the nights were not without their charm—a quiet profound and unbroken, save by the chirp of the insect, or the note of the Whip-poor-will. Their return led them through the Valley of Wyoming, and then through a wild and uncultivated country, reaching from Wilkes-Barré to Mauch Chunk. Not a blade of corn or a hill of potatoes, only here and there a mill or a rude house, gave evidence of human life. During July, one of the most diligent collectors was richly repaid in botanizing in the neighborhood of Brown's Mills, at New Lisbon, and by the sea-shore in New Jersey; along the banks of the Shenandoah, at Harper's Ferry; and later, at Pemberton, New Jersey. From all these localities specimens of various plants were preserved for the herbarium, and for the inspection of the Club. At Harper's Ferry was found Cacalia suaveolens, said by Gray to be rare, though of wide range.

From the Massachusetts coast, from Martha's Vineyard, from Clark's Island, the first landing-place of the pilgrim fathers, our modern pilgrims have gathered floral treasures and observed some oceanic phenomena. The schooner Storm King was engaged to make a little excursion across Cape Cod Bay to Provincetown, in what is called the "fist" of Cape Cod. The sea did not rage, the wind murmured for a time a gentle lullaby, then came a calm. The bay slept, but the inhabitants of the deep held a pantomime for the benefit of the excursionists; lazily rolled the sleek porpoises; the semi-human head of a seal pursuing a fish made its appearance; and the whale swam slowly by, spouting as he went, then suddenly withdrawing his huge form, all seeming to say: "You know the natural family, specimens not to be touched." With the afternoon breeze they glided into Provincetown. In this town the chief end of man (from a worldly standpoint) is the curing of mackerel. Aralia hispida and Silene inflata cling to the town house hill and gaze upon the mighty mackerel reservoir at their feet. At the midnight hour, the return sails were filled with a propitious breeze. A very brilliant phosphorescent display around the anchor and in the wake of the Storm King as though the Milky Way had suddenly been transferred from sky to sea, a wind-tossed ocean and a gorgeous sunrise enlivened the return to Clark's Island.

On another day, South Pond, one of the three hundred ponds of Plymouth township, was reached by a road remarkably like those of New Jersey, being lined by scrub oak and pines. At the pond abounded Pontederia and Nuphar, the three Droseras rotundifolia, longifolia, and filiformis in full bloom, and the showy Sabbatia chloroides. At Plymouth itself, the attention is fixed upon the relics of the past. The old Plymouth rock is probably the fragment of a great boulder, borne hither in the glacial period, itself therefore an ancient pilgrim. One tree (name not given) here spreads its branches. That tree bears honest fruit, for we read that "all lost articles are hung upon it and remain until claimed by their owners." If the tree is known by its fruits, may not this be a descendant of that fatal one in Paradise "the tree of the knowledge of good and evil?" Long may the ghosts of the honest pilgrims guard the sacred tree! Another party of three found opportunity of ocean study in a sea-voyage to Boston, and watched myriads of Medusæ floating around the steamer. Boston Common glories in its "old elm," that, spite of the tender efforts for its preservation, is rapidly yielding to the inroads of time. Nearly fifty years ago, an East India merchant brought from China a Gingko tree (Salisburia adiantifolia). This is one of the sacred trees of Japan, belonging to the family Coniferæ, a relationship not readily traced from its general aspect or from an inspection of its peculiar fan-shaped leaf. The Gingko is described by Downing as a tree of rapid growth, but this Boston one is a comparatively small tree, perhaps suffering from an uncongenial climate or from other changes interfering with its growth. In our own "Woodlands Cemetery," the Club has ever near it large and handsome specimens of this stranger now fairly naturalized. These Japanese trees were planted by Mr. Hamilton, in 1784, and are much admired as both curious and ornamental. From a survey of the never-sufficiently-to-be-admired lawns and trees, and shrubberies that adorn the suburban homes of Boston; through the barren hills and rocky farm-land, and the forests of spruce, fir, maple, and scrub-oaks to the clear Winnipiseogee and the region of the White Hills of New Hampshire, we have botanic notes. Now and then a fine specimen was accessible; here a Lilium Canadense four feet high bore ten beautiful hanging bells in various stages of advancement; there, a noble Orchid, the fragrant Platanthera fimbriata; and everywhere a profusion of bright berries. The red Cornus Canadensis and the bright-blue Clintonia borealis were mingled with many others not identified. Why is it that berries generally delight in a mountain home?

During the month of March, in the person of one of its members, the Club paid its respects to the (Dionæa muscipula) Venus' Fly-trap, in its own loved home, near Wilmington, N. C. "Nothing but leaves" was as yet to be found. The leaf, however, is the most interesting feature of this curious plant, which grew thick as dandelions in a northern meadow, and offered frequent proof of irritability on being touched. Many a fly was imprisoned in the living trap. Here also grew the Chaptalia tomentosa, the only labiate of the Composite Family in the United States. A Houstonia, with flowers of deep purple, and yellow eye, grew on the banks of the Savannah; and under the princely magnolias of Mobile Bay, Æsculus pavia, a shrub bearing long racemes of bright scarlet hue; on the banks of Lake Pontchartrain the abundant dwarf Palmetto, and in the swamps the blue Iris hexagona. A short visit to ditches, marshes, and bayous yielded thirty-three indigenous plants; and the strange-looking cypress knees, projecting from the miry ground, attracted attention. These are hollow conical knobs, often three or four feet in height, excrescences from the roots of Taxodium distichum. Among trees the Live Oak (Quercus virens) here arrests attention rather by its extent than its height. The outline of the leaf bears little resemblance to our northern typical oak-leaf. The same remark applies to the leaf of the Water Oak (Quercus aquatica), whose tall and slender form contrasts with the Live Oak. Ascending the Mississippi, the Cotton tree is found clothing its banks; nor must the graceful parasite, the Tillandsia, be unnoticed in a southern landscape. Its graceful festoons can never be forgotten. Leaving the Mississippi at Cairo, and travelling eastward, our tourist observes: "About fifty miles from Cincinnati commences a distinctive and well-marked Flora;" great clusters of Jeffersonia diphylla, the golden corolla of that sole Poppy indigenous to the United States (Stylophorum diphyllum), and the most foreign appearing of our native Trilliums, the sessile, its petals a rich maroon color, and its odor abominable. Later in the season, the July flowers of Mount Monadnock, New Hampshire, were partially studied by the same tourist, and compared with the Flora of the Peaks of Otter. Probably not one of the thirty of Monadnock were repeated in the seventy specimens collected one year before at the Peaks of Otter.

One report treated mainly of insects, collected and classified with care. This report was beautifully illustrated by the specimens described in the text. Birds' nests, eggs, two young snakes, and plants from New England, New Jersey, and Delaware were preserved for future reference. One whom circumstances detained in a quiet country home sends a study of a small but mischievous creature, one of the last summer's pests. On going to the garden to search for ripe tomatoes, I was surprised to find the vines lately so thrifty, drooping and stripped of much of their foliage. A large green worm with its devouring jaws was feasting on leaves and fruit. Its scientific name is a long one, but not too long, if measured by the loss and trouble which this insect caused to the farmer. The Sphinx quinquemaculatus is of a gray color; the four wings immaculated at the base, and the hind wings marked with two angulated bands; its body, stout and spindle-shaped, is ornamented with five orange colored spots on each side. This large Hawk-moth flies about in the evenings, and occasionally in the mornings of June. Its dark-green larva has a series of oblique greenish-yellow bands on the side; the head rather flattened; the back smooth, with a caudal horn often becoming quite red as the larva reaches its full size, more than three inches long. The caterpillar has sixteen legs, and clings firmly to vine or bush. When very young it is an object of interest, as the circulation and movements of its organs can be quite clearly traced. It consumes a leaf with astonishing rapidity, cutting it as smoothly as if by a pair of sharp scissors. During the last summer these larvæ passed from farm to farm like a devastating army over the potato fields of New Jersey. Some fields were partially destroyed; some had a few dead stems left standing, looking as though a fire had swept over them; some had nothing left to indicate that potatoes had been there. On marched the great army, regardless of intervening bushes, fences, and roads—scarce missing the hundreds now and then crushed under the horses' hoofs and the broad wagon wheels. On marched the great army, covering garden, yard, and piazza of the unfortunate homestead that lay in their path, for no home was secure from this Egypt-like plague. The people were dismayed, and rumor spread that even the potatoes whose vines had been devoured by these worms were charged with poison. "The land is as the garden of Eden before them, and behind them a desolate wilderness; they shall walk every one in his path; they shall march every one on his ways, and they shall not break their ranks; they shall run upon the wall; they shall climb up upon the houses; they shall enter in at the windows like a thief." So wrote the prophet Joel, twenty-six hundred years ago—then directed the people to that mighty Power, who limits all evils and guards all peoples of the earth.

One interested in geological research reports a visit to Rocky Garden on the side of Haycock mountain, ten miles east from Quakertown. Rocky Garden consists of an aggregation of trap rocks ranging from a hundred pounds to masses of tons in weight, apparently lodged in what was once a depression in the surface, for the edges of the tract correspond with the general slope of the surrounding land. These rocks are evidently of igneous origin; some are nicely balanced, and give forth a metallic ring on being rocked or struck. Many and warm have been the discussions among the advocates of different theories in regard to this deposit of rocks. One party contends that they are relics of the Glacial period, when the alleged ice-field with its great moraines swept over this part of the world. Seamed, notched, and water-worn, they bear the traces of hard travel in their early days. Another party argues that they have been injected through the earth's surface near which they lie. Prof. H. D. Rogers says: Across the northwestern portion of Bucks County, towards the northwestern side of the Mesozoic red shale, there is a tract of country where the formation is much altered in texture and color by the presence of a great body of trappean injections. While the metamorphic aspect of the strata is a sufficient demonstration of the near proximity of much igneous rock, only a comparatively small portion consists of actual trap-work, being often in insulated outbursts. One of these latter effusions of the trap is to be seen in the bold elliptical ridge called Haycock Hill, the crest of which is transverse to the more common direction of the dykes.

With this geological notice ends the brief summary of the interesting observations made during the holidays, notwithstanding the extreme heat of 1870. As the shortening days suggested more moderate weather and also the resumption of home duties and professional cares, the summer tourists returned to the city with unabated interest in their social studies and recreations. Thus, with Microscope, and Essay, and Report, and varied conversation, the year has passed away. Not so the lasting memory of communings with nature, and the happy companionship of the members of the Club. Entering upon the third year of its existence, the Club, like any two-year-old child, pleased with the present good, simply asks for "More!"—more of the picture-book, more spelling out of the golden text, more feasting at the well-spread board.

CAROLINE A. BURGIN,
Cor. Sec.

A LIST

OF THE

More interesting Plants identified by the Club during the Year 1870.

Ranunculaceæ. Ranunculus multifidus, Pursh, Newton, N. J.; R. Flammula, L., var. reptans, Lake George; R. pusillus, Poir., N. O. La.; R. Cymbalaria, Pursh, Martha's Vineyard; R. abortivus, L., var. micranthus, Cin.; R. muricatus, L., N. O. La.; Isopyrum biternatum, Torr. & Gray, Cin.; Trollius laxus, Salisb., Sussex Co. N. J.; Coptis trifolia, Salisb., Rindge, N. H.; Helleborus viridis, L., Quakertown, Pa.; Zanthorrhiza apiifolia, L'Her., Bartram's Garden, Phila.; Cimicifuga Americana, Michx., Alleghany Mts. Pa.

Berberidaceæ. Jeffersonia diphylla, Pers., Cin. O.

Nymphæaceæ. Brasenia peltata, Pursh, Lan. Co. Pa.; Nelumbium luteum, Willd., Phila.; Nymphæa odorata, Ait., var. minor, Sims., Martha's Vineyard.

Sarraceniaceæ. Sarracenia purpurea, L., Pemberton, N. J.

Papaveraceæ. Stylophorum diphyllum, Nutt., Cin. O.

Fumariaceæ. Adlumia cirrhosa, Raf., Del. Water Gap; Dicentra Canadensis, DC., Phila.; Corydalis glauca, Pursh, Del. Water Gap.

Cruciferæ. Arabis patens, Sulliv., Huntingdon Co. Pa.; A. hesperidoides, Gray, Pittsburg, Pa.; Lepidium campestre, L., Cape May, N. J.

Capparidaceæ. Polanisia graveolens, Raf., Wilkes-Barré, Pa.

Violaceæ. Viola rotundifolia, Michx., Watkins' Glen, N. Y.; V. delphinifolia, Nutt., Troy, Kansas; V. rostrata, Pursh, Del. Co. Pa.

Cistaceæ. Lechea thymifolia, Pursh, Martha's Vineyard.

Droseraceæ. Drosera rotundifolia, L., D. longifolia, L., D. filiformis, Raf., Plymouth, Mass.; Dionæa muscipula, Ellis, Wil. N. C.

Hypericaceæ. Ascyrum stans, Michx., Pemberton, N. J.; Hypericum Kalmianum, L., Niagara Falls; H. prolificum, L., Brown's Mills, N. J.; var. densiflorum, Salisbury, Md.

Caryophyllaceæ. Dianthus Armeria, L., Haddonfield, N. J.; D. prolifer, L., Phila.; Silene nivea, DC., Wash. Pa.; S. Virginica, L., Pittsburg, Pa.; Arenaria squarrosa, Michx., South Amboy, N. J.; A. Grœnlandica, Spreng., White Mts.; Stellaria borealis, Bigel., Montrose, Pa.; Sagina procumbens, L., Phila.; Spergularia media, Presl., Clark's Island, Mass.; Draba brachycarpa, Nutt., Augusta, Ga.

Malvaceæ. Sida Napæa, Cav., York Co. Pa.; Hibiscus moscheutos, L., Cayuga Lake.

Geraniaceæ. Geranium columbinum, L., Lan. Co. Pa.; G. pusillum, L., Gloucester, N. J.; Oxalis Acetosella, L., Watkins' Glen.

Rutaceæ. Ptelea trifoliata, L., Harper's Ferry, Va.

Polygalaceæ. Polygala lutea, L., P. Nuttallii, Torr. & Gr., Pem. N. J.; P. polygama, Walt., Duxbury, Mass.; P. paucifolia, Willd., Hardwick, Mass.

Leguminosæ. Trifolium stoloniferum, Muhl., Easton, Pa.; Medicago maculata, Willd., Camden, N. J.; Lathyrus maritimus, Bigel., Martha's Vineyard.

Rosaceæ. Prunus maritima, Wang., Martha's Vineyard; Spiræa opulifolia, L., S. corymbosa, Raf., Fulton Co. Pa.; Geum macrophyllum, Willd., Del. Water Gap; G. rivale, L., Hardwick, Mass.; Potentilla argentea, L., Clark's Island; P. Pennsylvanica, L., Rindge, N. H.; P. Anserina, L., Niagara Falls; P. tridentata, Ait., White Mts.; Fragaria Indica, L., N. O. La.; Dalibarda repens, L., N. Conway, N. H.; Rubus odoratus, L., Harper's Ferry; R. triflorus, Richardson, Rindge, N. H.

Saxifragaceæ. Ribes prostratum, L'Her., White Mts.; Itea Virginica, L., Pem. N. J.; Parnassia Caroliniana, Michx., Watkins, N. Y.

Crassulaceæ. Sedum telephioides, Michx., Harper's Ferry, Va.

Halorageæ. Myriophyllum tenellum, Bigel., Pike Co. Pa.; Proserpinaca pectinacea, Lam., Plymouth, Mass.

Onagraceæ. Circæa alpina, L., Bushkill, Pa.; Epilobium molle, Torr., Rindge, N. H.

Lythraceæ. Lythrum Hyssopifolia, L., Clark's Island; L. alatum, Pursh, Harper's Ferry; Nesæa verticillata, H. B. K., Salisbury, Md.

Umbelliferæ. Eryngium Virginianum, Lam., Salisbury, Md.; Discopleura capillacea, DC., Martha's Vineyard; Eulophus Americanus, Nutt., Wilkes-Barré, Pa.

Araliaceæ. Aralia hispida, Michx., Cape Cod.

Cornaceæ. Cornus Canadensis, L., Mt. Monadnock, N. H.

Caprifoliaceæ. Linnæa borealis, Gronov., White Mts.; Sambucus pubens, Michx., N. Conway; Viburnum nudum, L., var. cassinoides, V. lantanoides, Michx., Mt. Monadnock, N. H.

Valerianaceæ. Fedia olitoria, Vahl., F. radiata, Michx., Phila.

Compositæ. Elephantopus Carolinianus, Willd., Lan. Co. Pa.; Liatris scariosa, Willd., Fulton Co. Pa.; L. graminifolia, Willd., var. dubia, Pem. N. J.; Eupatorium album, L., New Lisbon, N. J.; Nardosmia palmata, Hook, Radnor, Pa.; Tussilago Farfara, L., Cayuga Lake; Solidago squarrosa, Muhl., Fulton Co. Pa.; S. puberula, Nutt., Pem. N. J.; S. Virga-aurea, L., var. alpina, Bigel., Mt. Monadnock; var. humilis, Gray, Martha's Vineyard; S. thyrsoidea, E. Meyer, Mt. Washington; S. sempervirens, L., Martha's Vineyard; S. odora, Ait., Pem. N. J.; Chrysopsis falcata, Ell., Pluchea camphorata, DC., Martha's Vineyard; Polymnia Canadensis, L., Harper's Ferry; P. Uvedalia, L., Easton, Pa.; Xanthium spinosum, L., Harper's Ferry; Coreopsis discoidea, Torr. & Gray, Easton, Pa.; Cacalia suaveolens, L., Harper's Ferry; Senecio lobatus, Pers., Krigia Caroliniana, Nutt., N. O. La.; Troximon cuspidatum, Pursh, Troy, Kansas; Sonchus arvensis, L., Clark's Island; Chaptalia tomentosa, Vent., Wil. N. C.

Lobeliaceæ. Lobelia Kalmii, L., Niagara Falls; L. Dortmanna, L., Gilmanton, N. H.

Ericaceæ. Gaylussacia brachycera, Gray, Perry Co. Pa.; Vaccinium Vitis-Idæa, L., N. Conway; Chiogenes hispidula, Torr. & Gr., Rindge; Cassandra calyculata, Don., Pem. N. J.; Kalmia hirsuta, Walt., S. C.; Rhodora Canadensis, L., Belk. Co. N. H.; Ledum latifolium, Ait., Rindge; Pyrola secunda, L., Del. Water Gap.

Aquifoliaceæ. Ilex mollis, Gray, Alleghany Mts. Pa.

Styracaceæ. Symplocos tinctoria, L'Her., Mobile Bay.

Plantaginaceæ. Plantago maritima, L., var. juncoides, Duxbury, Mass.

Plumbaginaceæ. Statice Limonium, L., var. Caroliniana, Duxbury, Mass.

Primulaceæ. Trientalis Americana, Pursh, Mt. Monadnock.

Lentibulaceæ. Utricularia intermedia, Hayne, Cin.; U. subulata, L., Pem. N. J.

Orobanchaceæ. Orobanche minor, L., Phila.

Scrophulariaceæ. Verbascum Lychnitis, L., Phila.; Collinsia verna, Nutt., Wash. Co. Pa.; Veronica Buxbaumii, Tenore, Phila.

Verbenaceæ. Lippia lanceolata, Michx., Harper's Ferry.

Labiatæ. Calamintha glabella, var. Nuttallii, Gray, Niagara Falls; Monarda didyma, L., Watkins, N. Y.; Stachys hyssopifolia, Michx., Plymouth, Mass.

Borraginaceæ. Heliotropium Europæum, L., Harper's Ferry.

Hydrophyllaceæ. Ellisia Nyctelea, L., Lan. Co. Pa.; Phacelia Purshii, Buckley, Pittsburg, Pa.; P. parviflora, Pursh, Lan. Co. Pa.

Polemoniaceæ. Phlox reptans, Michx., Del. Co. Pa.; Diapensia Lapponica, L., White Mts.; Pyxidanthera barbulata, Michx., Pem. N. J.

Convolvulaceæ. Cuscuta compacta, Juss., Pem. N. J.

Gentianaceæ. Sabbatia lanceolata, Torr. & Gr., Pem. N. J.; S. gracilis, Salisb., Squan, N. J.; S. chloroides, Pursh, South Pond, Plymouth, Mass.; Erythræa ramosissima, Pers., var. pulchella, Griseb., Susquehanna, Pa.; Gentiana detonsa, Fries, Niagara Falls; G. ochroleuca, Frœl., Fulton Co. Pa.; Bartonia tenella, Muhl.; B. verna, Muhl., Martha's Vineyard; Limnanthemum lacunosum, Griseb., Pike Co. Pa.; L. trachyspermum, Gray, Salisbury, Md.

Asclepiadaceæ. Enslenia albida, Nutt., Harper's Ferry.

Aristolochiaceæ. Asarum arifolium, Michx., Wil. N. C.

Chenopodiaceæ. Atriplex arenaria, Nutt., Salicornia herbacea, L., Suæda maritima, Dumor., Clark's Island, Mass.

Polygonaceæ. Polygonum articulatum, L., Pem. N. J.

Elæagnaceæ. Shepherdia Canadensis, Nutt., Niagara Falls.

Saururaceæ. Saururus cernuus, L., Harper's Ferry.

Euphorbiaceæ. Euphorbia polygonifolia, L., Squan, N. J.

Empetraceæ. Empetrum nigrum, L., Canada; Corema Conradii, Torr, Martha's Vineyard.

Cupuliferæ. Quercus virens, Ait., Q. aquatica, Catesby, New Orleans.

Myricaceæ. Myrica cerifera, L., Martha's Vineyard.

Coniferæ. Pinus Lambertiana, Dougl., California.

Palmæ. Sabal Adansonii, Guerns., New Orleans, La.

Araceæ. Arisæma Dracontium, Schott, Wissahiccon, Phila.

Lemnaceæ. Lemna minor, L., Canada (in flower); Wolffia Columbiana, Karsten, Phila.

Hydrocharidaceæ. Hydrodictyon utriculatum, Roth., Phila.

Orchidaceæ. Habenaria Hookeri, Torr., Del. Water Gap; H. orbiculata, Torr., Rindge; H. ciliaris, R. Br., Fulton Co. Pa.; H. fimbriata, R. Br., White Mts.; Spiranthes simplex, Gray, Martha's Vineyard; Microstylis monophyllos, Lindl., Mt. Monadnock; Aplectrum hyemale, Nutt., Phila.; Cypripedium parviflorum, Salisb., Lewisburg, Pa.

Hæmodoraceæ. Lachnanthes tinctoria, Ell., Pem. N. J.

Bromeliaceæ. Tillandsia usneoides, L., S. C.

Iridaceæ. Iris Virginica, L., Squan, N. J.; I. cuprea, Pursh, New Orleans.

Liliaceæ. Trillium sessile, L., Cin.; T. grandiflorum, Salisb., Pittsburg, Pa.; T. erythrocarpum, Michx., Rindge; Amianthium muscætoxicum, Gray, White Haven; Helonias bullata, L., South Amboy; Streptopus roseus, Michx., Mt. Monadnock; Clintonia borealis, Raf., Mt. Washington; Smilacina stellata, Desf., Niagara Falls; S. trifolia, Desf., Pike Co., Pa.; Erythronium albidum, Nutt., Cin.

Juncaceæ. Juncus marginatus, Rost., J. tenuis, Willd., J. pelocarpus, E. Meyer, Clark's Island; J. militaris, Bigelow, Brown's Mills, N. J.

Eriocaulonaceæ.. Eriocaulon septangulare, With., Plymouth, Mass.

Cyperaceæ. Rhynchospora alba, Vahl., Pem. N. J.; Scleria verticillata, Muhl., Erie, Pa.; Carex æstivalis, M. A. Curtis, Tioga Co., Pa.; C. platyphylla, Carey, Easton, Pa.; C. subulata, Michx., Brown's Mills, N. J.

Gramineæ. Stipa avenacea, L., Gloucester, N. J.; Spartina cynosuroides, Willd., Niagara Falls; Tricuspis purpurea, Gray, Erie, Pa.; Eragrostis poæoides, Beauv., Phila.; Danthonia spicata, Beauv., Gloucester, N. J.; D. sericea, Nutt., Brown's Mills, N. J.; Phalaris Canariensis, L., Phila.; Andropogon macrourus, Michx., Pem. N. J.

Equisetaceæ. Equisetum limosum, L., Lake George.

Filices. Cheilanthes vestita, Swartz, Del. Water Gap; Pellæa atropurpurea, Link, Phila.; P. gracilis, Hook, Watkins' Glen; Woodwardia Virginica, Smith, W. angustifolia, Smith, Pemberton, N. J.; Camptosorus rhizophyllus, Link, Phila.; Phegopteris polypodioides, Fee., P. Dryopteris, Fee., Del. Water Gap; Aspidium spinulosum, Swartz, A. Goldianum, Hook, Trenton Falls, N. Y.; Cystopteris bulbifera, Bernh., Watkins' Glen; Woodsia obtusa, Torr., Harper's Ferry; W. Ilvensis, R. Br., Del. Water Gap; Lygodium palmatum, Swartz, Pem. N. J.

Lycopodiaceæ. Lycopodium Selago, L., Mt. Wash.; L. inundatum, L., var. Bigelovii, Tuck., Pem. N. J.; Selaginella rupestris, Spring, Del. Water Gap; Isoetes Engelmanni, Braun, Del. Water Gap.

Musci. Leucobryum minus, Hampe, Camden, N. J.; Buxbaumia aphylla, Haller, Diphyscium foliosum, Web., Phila.; Atrichum crispum, James, Camden, N. J.; Leskia rostrata, Hedw., Phila.; Platygyrium repens, Bryol, Camden, N. J.

Lichenes. Umbilicaria Dillenii, Tuck., Mass.

FOURTH ANNUAL REPORT

OF THE

Natural History Club of Philadelphia.

Read December 21, 1871.

BY

J. G. HUNT, M.D.

PUBLISHED BY ORDER OF THE CLUB.

PHILADELPHIA:
COLLINS, PRINTER, 705 JAYNE STREET.
1872.

FOURTH ANNUAL REPORT

OF THE

NATURAL HISTORY CLUB OF PHILADELPHIA.

DECEMBER 21, 1871.

WE come together this evening, as you are aware, to commemorate the fourth anniversary of the Natural History Club of Philadelphia. And in endeavoring, doubtfully, to perform my duty on this occasion, I must ask your indulgence if I listen, for a moment, to the voice of remembrance, coming as it does from the entire period of our various meetings through the changing seasons of six delightful years.

Cannot each member recall the difficulties encountered in our first attempts at determining even the names of many objects we desired to study? And the necessity to learn, first, a multitude of related but indifferent facts, before the final fact we desired could be reached, often has been discouraging. The toilsome search for technical description, and our general unacquaintance with the literature of most branches of descriptive science, often made our progress embarrassing and slow. But all that training was necessary, and has been useful. The lessons we learned—the lessons I hope we learned—viz., to take nothing for granted without proof of its truth; to reason along, step by step, from the known to the unknown; the habit of allowing a question to remain undecided until satisfactory proof could be obtained; that kind of training which science exacts of her students enables us to meet, on this anniversary, intellectually stronger men and women than was our condition six years ago.

Let us not fall into the erroneous conclusion that true culture aims at special ends. It is not to become a mineralogist, or botanist, or zoologist, or astronomer, that a man should force upon himself the harness of intellectual hard work, but that he should thus grow into a juster knowledge of the true value of all things; that he should learn to measure and duly estimate all that lies embraced between the smallest and the greatest in life, that he should learn—

> "To run
> The great career of justice, to exalt
> His generous aim to all diviner deeds;
> To chase each partial purpose from his breast,
> And through the mists of passion and of sense,
> And through the tossing tide of chance and pain,
> To hold his course unfaltering, while the voice
> Of truth and virtue up the steep ascent
> Of *Nature*, calls him to his high reward."

The various meetings of the Club have been well attended during the past year. An average of fifteen members at each meeting marks an interest in the object of our organization quite favorable in comparison with similar societies. We cannot claim, we do not wish to claim, to have advanced the cause of natural science by original research into any of its kingdoms, but, I trust, we each feel a little growth in our knowledge of *things*, and can look around over a more beautiful and wider intellectual horizon than surrounded us one year ago.

The custom of each member, in succession, presenting an original essay at the various meetings has been profitable, and has led to much of interest that otherwise would have been lost.

In attempting to offer a hurried *resumé* of our work for the year, I confess it is no light task to do justice to all, especially when subjects of such varied character have been presented.

While patches of last year's snow yet lay like crystal cushions in the fence corners, the Sparrows were brought before the Club for better acquaintance. Not for the splendor of their plumage, nor ravishing melody of song, do these little birds appeal to our notice. They come among us trustingly and socially to pick up the crumbs that fall from our tables, or the seeds from our granaries, and we all bid them welcome.

"The classification of Prof. Baird places the Sparrows in the order *Insessores;* family *Fringillidæ*, or seed-eaters. Audubon and Wilson embrace the Sparrows in one genus—*Fringilla.* One or two species remain with us all winter, so that at all seasons representatives of this family are found among us. One of our earliest birds to return from the South is the fox colored Sparrow—*Fringilla rufa*, of Wilson. Very early does this bird leave the cypress swamps and rice plantations of the sunny South, and, treading closely in the retreating footsteps of winter, makes its appearance in the latter part of February or early in March. It tarries not long with us, but passing through New England, spends the summer in the bosom of the fur country."

"Later in the season the white-throated Sparrow (*Fringilla albicollis*, of Wilson) commences its journey northward, reaching us about the middle of April. This is the handsomest of all our Sparrows. Its song is full of melody, uttered at first loud and clear, then rapidly falling in tone and decreasing in volume.

"Arriving rather earlier than the last, we have the Chipping Sparrow, or Hair-bird. Although it does not possess the sweetness of song of some, and lacks the beauty of plumage of others, it gains many friends by reason of its sociability. It builds its nest even among the vines that twine around the doorway; in the city, too, it makes its abode, and may be seen among the shade-trees in our public squares. It becomes so familiar that it will peck the crumbs from one's hand. The Song Sparrow (*Spizella melodea*), is our earliest spring songster, and is also the latest resident of our singing birds.

"The Tree Sparrow (*Spizella monticola*) arrives in flocks about the middle of November, and often associates like brothers with the Snow-birds. It remains during the entire winter, but when the soft airs of spring begin to blow, they bear it northward."

Not soon will I forget an incident connected with one little member of this family of birds. In company with some children, I was hunting cryptogams on the ice-crowned rocks near the city. A plaintive bird-cry of distress arrested my attention, and on looking up, just on the brow of a rock fringed with icicles as large and as long as my arm, and on a patch of frozen moss, I discovered a Sparrow. Evidently it had sought shelter through the night on the moss, but the trickling water had frozen, and one leg of the Sparrow was encased in the ice, and it could not escape. Quickly I cut it loose, but its leg was fractured, and it soon died. I was reminded of Shelley's "Widowed Bird"—

"A widow-bird sate mourning for her love
Upon a wintry bough;
The frozen wind crept on above,
The freezing stream below.

"There was no leaf upon the forest bare,
No flower upon the ground;
And little motion in the air,
Except the mill-wheel sound."

It seems natural to regard with increased affection the birds that remain with us during the winter. A corresponding member informs us it is rare to see the Snow Bunting near Philadelphia in winter. In the severe cold seasons of 1856 and '59, a few were procured, and the taxidermist remarked he had never before been called upon to mount one.

"Another winter visitor quite rare in this vicinity is the Shore Lark—*Alauda alpestris*, of Wilson. At no time are they found in abundance, but a careful observer may see some every winter. Generally flying in small detached flocks, they are occasionally seen feeding along our travelled roadways, but more commonly on stubble-fields grown up with ragweed, on the seeds of which they feed. They soon grow accustomed to man, and will approach their food when strewn on the snow beneath the window. A flock of twenty-four in number was thus attracted by our member, who enjoyed their social bird-talk as they busily picked their food. Their note is not unlike that of the Song Sparrow. Regularly did they come, day after day, until the first Blue Bird sang its greeting song, and they knew it was the voice of the flower-crowned spring they heard, and they left to return no more, doubtless pausing not in their journey until they rested—

"'Where the Arctic hurls its billows,
On the wild and rocky shore;
And the iceberg in its grandeur,
Stems the tides that round it roar.'"

Like a table well spread with many desserts, have been all our club meetings. Every worthily directed taste has found expression and enjoyment. The lover of the melody of the birds, equally with those who enjoy the fragrance of the ever-beautiful flowers; those who look more deeply into the invisible mysteries of Nature's secrets, and those who prefer to be silent, have all found sympathy and given compensation.

A few well-kept secrets of the plant world have been opened to us through that wonderful little "gateway," the simple cell. We entered that little world—that microcosm—and saw that soluble dextrine and pearly grains of starch appeared, a temporary solidified condition of the nameless principle of the plant. In receiving the command to work for the ages, that little cell, around each pellicle of rapidly dividing protoplasm, builds a wall of crystal, the ultimate and insoluble—dead—condition of that same nameless substance of which dextrine, starch, and cellulose are merely different states.

But these are not all the products which the fertile protoplasm can create. The list is legion. We shall look into those cells only which manufacture the color of plants. As a rule, these cells are just below the epidermis, and our theme—coloration of the leaf—refers to the color as seen ready formed through the wall of the cell.

The colors ready formed in the plant are usually comprehended under the terms chlorophyl and chromule—the first referring to the leaf-green and the second to the varied tints of flowers.

Although chlorophyl is almost universally present in the surface cells of the leaf and herbaceous stem, it really exists only in minute quantities in plants. The leaves of a large tree, according to Berzelius, contain not more than 100 grains of chlorophyl. When any of the chlorophyl granules are treated with ether or alcohol, the green color is abstracted while the granules remain. Many and conflicting statements run through the works of different observers, as to the relation of chlorophyl and starch. The nearest approach to truth appears to be that the chlorophyl structures are granular structures belonging to the general protoplasmic nitrogenous cell-contents, that they become colored green in the light; a chemical change connected with the vital processes. Perhaps I am not justified in going this far in speaking of the formation and nature of chlorophyl, and the language I have used will tell you much obscurity envelops the subject. It is very difficult to pause just where our knowledge ends, because then we often have not much to say. In regard to chlorophyl, Mr. H. C. Sorby says that, "on treating an alcoholic solution obtained from green holly leaves with excess of bisulphide of carbon, the part carried down in solution in the bisulphide did not give the same spectrum in the microscope as that left in the alcohol." "There being thus evidence of a mixture, he tried the experiment over and over again, in order to ascertain whether a more complete separation could be obtained, and found that, if the leaves were well crushed and then heated in alcohol, the solution rapidly filtered, and treated with the bisulphide as soon as cold, it could be separated into a deep green, carried down by the sulphide, and an almost clean yellow left in the alcohol, which corresponded with the xanthophyll of yellow leaves." "The separation was indeed so complete, that for an equal amount of xanthophyll this yellow solution did not contain above one-thirtieth the amount of chlorophyl contained in the other solution, so that a mixture of these two colors in ordinary green leaves is placed beyond all doubt," as also shown by Prof. Stokes. (*Journal of the Chemical Society*, June 2, 1864.) This subject will be resumed at our meetings in the coming year, and the Club is in possession of similar apparatus to that with which Mr. Sorby made his observations.

"An interesting observer (Sachs) suggests that the vegetable plasma eliminates a principle possessing the constitution of the green of the leaf, which, in the cell, waits a last impulsion to become leaf-green. This impulsion, he further suggests, is given less by light than by nascent oxygen, or oxygen ozonized, made active by the influence of light; and to that principle he gives the name of leukophyll.

"Some observers consider the soluble matter of chlorophyl an immediate green principle; others a mixture of yellow and blue. Fremy calls the yellow principle phylloxanthine—the blue, phyllocyanine. The blue principle is exceedingly sensitive to acids, changing to red whenever they appear.

"The changes in autumn in the leaf from green to red, from red to orange, may be accounted for thus. The plant having reached maturity, and ripened its fruit, the deposition of its principles which combined to make the leaf green, becomes slower, the tide of life is ebbing. Of these principles the leaf-blue is the more unstable, and it begins to decompose first, and, by oxidation, assuming the red, &c., until the supply of leaf-blue having ceased, leaf-yellow alone remains.

"Applying this explanation then to what are now known as 'leaf-plants,' it affords the most satisfactory clue to the cause of their many and beautiful colors.

"The protoplasmic granules in a red-leaved plant may be as healthful and vigorous as in a normal green-leaved plant. But for some reason, in the cells of the leaves, leaf-yellow only, or leaf-blue only, is deposited; the plant, therefore, assuming a primary tint, and not the secondary compound green."

Not only in the glorious coloration of the leaves of our cultivated and forest plants have we studied our friends that clothe the earth in green, and give perfume to summer's air, but the unfolding of leaves was illustrated by a member in an essay which divided all leaf buds into two great classes, viz., those developing in uninterrupted vegetation, as in plants of tropical countries; these are also called open buds, because the outer leaves are similar to the inner, all developing alike into perfect leaves. And, secondly, buds with vegetation dormant for a time; these Linnæus called "hibernacula," or winter-quarters of the young branch.

"The arrangement of the foliar organs is denominated Vernation or Præfoliation in leaf-buds, and Æstivation or Præfloration in flower-buds; but Schleiden considers that in the bud condition, it is all one, whether the foliaceous organs be modified or not, and uses in his classification the terms, Vernation and Foliation—the first to denote the foldings of the leaf with relation to itself; the second, its position with relation to the other leaves of the same bud."

Beautiful and accurate drawings, illustrating this entire subject, were presented to the Club when the subject came before us for study, and, of course, added much to a clearer understanding of the earlier conditions of vegetation.

The ripe seed; many and curiously fashioned fruits with the complex and strange receptacles containing them, have not been passed over without attention. We can all acknowledge that botany has many attractive fields, other than classification and identification of species.

“The pericarp and the fruit it contains is, perhaps, the simplest definition of a fruit. We have seen, too, that the ovary of a simple pistil consists of the folded blade of a single leaf, and resembles it in minute structure.

“Alterations sometimes take place during the growth of the fruit, in the suppression of some of its parts, in the number of cellular divisions, and seeds become sometimes obliterated. In the genus *Quercus*, for instance, the ovary consists of three cells, with a pair of ovules in each cell, but the walls of the cells and five ovules are suppressed in progress of development, and the pericarp ultimately becomes one-seeded. The appendages of seeds, and the varied markings ornamenting them, we have seen to be very beautiful. All the cotton in the world, whether woven into royal attire for the living, or wrapped in spotless folds around the dead, is but the hairs growing from the epidermis of little seeds. These hairs are often arranged in tufts which resemble pappus in appearance; but we note this essential difference, while the pappus is a degeneration of the limb of the calyx, and is on the *outside* of the pericarp, the crest is an extension of the epidermis, and is *within* the cells of the fruit and *upon* the *seed* itself. These two kinds of tufts, moreover, are hygroscopic, approximating their filaments when moist, diverging when dry—the pappus draws the achemium out of the involucrum—the crest carries the seed out of the pericarp.”

It is owing to this hygroscopic epidermis that some seeds creep about over the table or bury themselves in the earth; others of lighter structure are lifted into the air, and, entering rising currents in the atmospheric ocean, are borne in triumph above the clouds.

The study of the grasses, especially the *Cerealia*, the source of food for the toiling millions and thinking few of mankind, has received attention, and much progress has been made in the analysis of this difficult order.

Not only from science, in its ordinary sense, has the subject just discussed received elucidation; but in the poetical brain of Goethe originated first the idea that the leaf was the fundamental organ of vegetation, and science has confirmed his conception.

More thoroughly than in any former year has the Club studied the leaf, in its earliest as well as in its last connection with the plant. The fall of the leaf has been a subject of interest to the Club. "If we examine a young and vigorous petiole in the spring, we may observe a faint line externally, that marks the position of the future joint, while internally there is little indication of its existence. If we make a thin section at this part, we observe simply an increased deposit in the cells composing the bark, and a very minute process passing from its inner surface. The line of junction in the interior seldom presents any change more marked than a deposit of crystals, or of some dark resinous material. At this time the leaf requires considerable force to separate it from the branch, and if a branch be cut off and dried, the leaf can, only with difficulty, be torn from it, thus showing that the joint is not yet complete. The advancing season, however, brings a change, and the line of demarcation becomes well marked, so that the unassisted eye can detect it throughout its course. The microscope now shows that the process of bark which was, at first, rudimentary, has gradually increased, and that a change is taking place in the contents of the cells which contained the crystals. As the season advances this process of bark increases perceptibly until it reaches the bundle of vessels in the centre of the petiole, finally these vessels become absorbed and the epidermis covers entirely the surface of the articulation. Now any passing breeze may hurl the suicidal leaf to its grave;" and thus are our forests defoliated in obedience to structural laws, written beforehand on the soft tissue in the bud.

The genus *Fedia* has been very fully elaborated this year by a corresponding member, who sent accurate drawings illustrating the fruit in four species, thus showing the distinctions upon which the specific characters are founded.

In the lower orders of the animal kingdom our studies have been quite limited. A valuable monograph on the Mollusca, richly illustrated by natural specimens of the various divisions of the order, and also by numerous drawings, has been presented to the Club.

Among the butterflies, the genus *Papilio* was beautifully illustrated by the mature insects, as well as by the chrysalides; the exquisite coloring, and peculiar markings of each species were noted and admired by the members.

The *Lamellibranchiata*, the oysters, the clams, and the mussels, with many of their curious relatives, had their general anatomy and eccentric habits elucidated before the Club, thus extending and widening our acquaintance with several departments of natural science not much studied before.

In our study of bird-architecture we saw that even a subject so varied in form and style was susceptible of classification. Birds that build on the ground, as the meadow lark and partridge; mining birds, like the kingfisher and bank-swallow; mason birds, as barn-swallows and chimney-swallows; and the carpenter birds, illustrated by the woodpecker, are common types of each division in this really natural classification.

In the great department of cryptogamic botany not much work has been done by the Club during the year.

The Lichens, old and gray as the finger-spots of Time, dotting the weather-beaten rock, or aged forest trunk, or painting in colors gray and green the zigzag fences running through the farms near our city; the frail mosses, listening in everlasting patience to the trickling water-drops by the fountain; enduring hygroscopic forerunners of a grander vegetation—the dancing ferns—the ever-coming and ever-vanishing fungi, extinguished relics of the beautiful meteors we call falling stars; all have been studied, but we hope to know more of their structure and forms in the coming year.

Time permits only a rapid glance at the interesting reports sent to the Club after the summer vacation. Our members have wandered widely during the year, and in every instance the fact is manifested, that our simple Club studies not only stimulate observation, but also direct it towards definite and worthy ends.

From North Sandwich, New Hampshire, among the cloud-capped mountains; and from North Conway, from the higher peaks of the fir-fringed White Mountains, and from central

New York among her charming lakes, Cayuga, Seneca, Skeneateles, Cazenovia, Otsego; localities rendered classic by the explorations of Pursh, botanist of a past generation, comes the same sweet song, viz., that nature is lovely in all her aspects, that the immortal fountain of life still pours its mysterious force into plant and soaring bird and humming insect, and into curious sea-creatures, each one but a chord in that sublime harp whose melody can be heard only by those who "ask that they shall receive, who seek that they shall find."

From many localities along the restless shore of the salt sea, from Harper's Ferry, from the pioneer cities, and waiting coast line of Lake Superior; from our own Pennsylvania mountains nearer home, contributions have been sent sparkling with mental diamonds and rich in whatever was beautiful or interesting to the Club.

Strange as it may appear to us to-night, my friends, as we sit here, reaping the little harvest of our year's work, some of our beloved members report botanical gatherings in Watkin's Glen. The *Diervilla trifida* opened its honey-colored blossoms mid trickling rills falling from the rocks in that weird and startling grotto. And I confess, with half regret, that I plucked a fine specimen of *Microstylis ophioglossoides* (Nutt.) from a rock looking right down into Cathedral Glen. But I had not the power to concentrate my attention on botanical studies while I stood in presence of the sublime personality of the glen. Its mysterious wildness, its dark and subterranean labyrinth winding along through the groaning bosom of our mother earth; that unmatched and charming intermingling of light and shadow; the overhanging green trees fringing the cliffs like sentinel eyelashes of some Titanic monster; and that eternal monotone of her tossed and troubled waters, seeking rest like some sad human soul, but finding none, were enough without flowers.

"Sphere of magic, dream and vision,
Now it seems are opening o'er us.
See how trees on trees in legions,
Hurrying by us change their places,
And the bowing crags make faces;
The giant-snouted crags, ho! ho!
How they snort and how they blow.

Down through stones, through mosses flowing,
See the brook and brooklet spinning;
Hear I rustling? hear I singing?
Love plaints sweet and melancholy,
Voices of those days so holy?
All our loving, longing, yearning,
Echo, like a strain, returning
From the olden time, was ringing"
In the voice of Watkins' Glen.

"Natural history includes man, as well as all the myriad organisms below him, and every fact belonging to his nature and experience is a fact that has a scientific value whether we have found it, or otherwise."

To study natural science, and gather only a stupendous harvest of *facts*, and "special properties, without perceiving their wide range of affinities—*without feeling a sense of something finer than knowledge*—is to miss its richest rewards."

"Beautiful are the flowers, and to be able to recognize their form and names, habitats, and different organs, is a great attainment, but this is only the beginning of the study of botany. They have microscopic structures and marvellous life functions, and whoever should become able to understand these altogether would possess the key to a knowledge of all organized beings. Each flower, in its mode of growth and reproduction, in the way it consolidates gases and liquid matter into its firmer structures; in the circulation, definite but rhythmic continually taking place in its loose parts; in the development of all parts from a common leaf-like bud; in its respiratory surface and its digestive and assimilative apparatus, in its chemical constitution and definite term of life, it is allied to all forms of life, above it and below. Nor do its affinities stop here. When again we recognize that it consists of the same carbon, oxygen, nitrogen, and hydrogen which form the principal part of the crust of the earth and its atmosphere, and which also constitute the bulk of all animal bodies; moreover that the same imponderable forces, light, heat, electricity, life, &c., which move all matter are necessary to its development, we perceive at once the relation between plant-life and the earth, and all upon it, and the study of botany becomes not merely a study of floral forms and names, but a contemplation of the *one plan of Nature* in all the evolutions of the world.

"It is in this wide view of relations, that special knowledge in particular departments of science acquires its highest interest and richest meaning; it is this perception of the affinities of things which causes all the facts of natural history, long considered as detached and unrelated, to converge into one grand related brotherhood of forms. Botany, ornithology, entomology are but superficially studied if they do not give us a clearer comprehension of the unity of Nature, and of the sublime simplicity of its universal plan."

My task is now accomplished. It was my duty simply to pick up the tangled thread of our united thought as it lay in the minutes of our secretary, and to weave it into a many-tinted patchwork, which I offer as the best I could do.

We have studied many material forms during the year, and I trust we have seen that matter, whether found in the creeping worm, or thinking bioplasts of the human brain, is but the ink with which God engraves His records upon the worlds. We read, and we admire—we ponder the deep meaning, and we adore.

J. G. H.

FIFTH ANNUAL REPORT

OF THE

Natural History Club of Philadelphia.

BY

CAROLINE A. BURGIN.

Read December 13, 1872.

PUBLISHED BY ORDER OF THE CLUB.

PHILADELPHIA:
COLLINS, PRINTER, 705 JAYNE STREET.
1873.

FIFTH ANNUAL REPORT

OF THE

NATURAL HISTORY CLUB OF PHILADELPHIA.

DECEMBER 13, 1872.

THE members of the Natural History Club of Philadelphia on occasion of their Annual Meeting again pause to consider what they have been able to accomplish during the year, and what progress they have really made in the pathway of truth. Such pauses are useful; for oppressive indeed is the keen sense of ignorance that sometimes overwhelms and threatens to crush the searcher after truth, whose aspirations, alas! so far transcend his capabilities. At such times the mind fails to recognize the reality of its gradual onward movement, and needs to gather fresh courage by laying aside all present reference to the unattained and the unattainable, and by dwelling with grateful recollections on the pleasures and treasures that have abounded in the past,

> "Thick as autumnal leaves that strow the brooks
> In Vallombrosa, where the Etrurian shades
> High overarch'd imbower; or scatter'd sedge
> Afloat, when with fierce winds Orion arm'd
> Hath vex'd the Red Sea coast."

Man knows but little, and in this short earthly life may know but little more; nor shall he learn that little in the natural as in the spiritual world until he becomes like an earnest child inquiring for truth, with receptiveness, with humility, with faith. In such the study of nature tends to produce serenity of mind and harmony of feeling. Nor is this strange;

for the objects studied are not the awkward products of human skill "graven by art and man's device;" they bear the exquisite touches of the Divine hand, and cannot be observed without exciting wonder and admiration.

> "Yet nature's care, to all her children just,
> Endows, at large, whatever happy man
> Will deign to use them." "Not a breeze
> Flies o'er the meadow, not a cloud imbibes
> The setting sun's effulgence, not a strain
> From all the tenants of the warbling shade
> Ascends, but whence his bosom can partake
> Fresh pleasure unreproved. Nor thence partakes
> Fresh pleasure only: for th' attentive mind,
> By this harmonious action on her powers,
> Becomes herself harmonious."
> "The sun's unwearied course,
> The elements and seasons, all declare
> For what th' eternal Maker has ordain'd
> The powers of man. He tells the heart
> He meant, He made us to behold and love
> What He beholds and loves, the general orb
> Of life and being: to be great like Him,
> Beneficent and active. Thus the men
> Whom nature's works can charm, with God himself
> Hold converse; grow familiar, day by day,
> With his conceptions, act upon his plan;
> And form to his the relish of their souls."

But, alas! that we find so many who rebel against the order and the harmony of the Cosmos.

A few days ago my attention was directed to the title pages and contents of some quaint volumes of the fifteenth century, setting forth the superstitions of the middle ages, relative to both spiritual and natural phenomena. Are such superstitions confined to the dark ages? Methinks there are still some who practically believe that the whole animated world (except themselves) has been created, and is now governed by a malevolent being; and that the chief end of man is to contend with this creation. Alike ignorant of God, who is the essence of Good, and of His works which He pronounced "good," they conceive that every object to them new or unfamiliar is injurious in its character or qualities. To them every vine is a Rhus toxicodendron; every exotic tree, an Upas; every glossy berry, a deadly nightshade; every spider, a tarantula; every insect, a scorpion; every serpent, a copper head: in short, to sting, to bite, to poison, to destroy, is the special mission of herb, root, tree, insect, and animal.

The beautifully striped or speckled snake, whose graceful curves no imitation of art may approximate, is ruthlessly slain. The Dragon-fly, fit emblem of untiring activity in his life-work, is slanderously called the Devil's needle; and, if the velvet-covered bat arouses from his all-day sleep and inadvertently enters a house where he would gladly feast on the annoying fly, or roach, or mosquito, he is received with savage yells of women and more savage array of hostile weapons by the men; all justifying such conduct because, forsooth, the bat might be entangled in their hair. Fungi generally are considered very dangerous, and the only known purport of the puff-ball curiously crowded with untold myriads of purple spores is to produce blindness.

Having looked upon that illustration of Dante's Inferno which represents the dismal procession of false prophets, whose punishment for deluding the denizens of earth consists in walking ever forward, whilst their heads are so reversed upon their shoulders that they must ever look backward and never more see whither their footsteps tend, I take warning and dare not prophesy the judgment of future times concerning the current superstitions of our dimly-lighted age.

In such an age, no man has a right to live unto himself; he should labor to search after the undiscovered truth, or at least to be the appreciative recipient and the conscientious preserver and communicator of already discovered truth. Let us then, as lovers of nature, examine what treasures we have garnered during the year. A child's playhouse presents not a more curious medley than the objects which we have more or less superficially observed. Here are animalculæ and infusoria; cells and tissues; ova and spores; fibres and muscles; fungi and mosses; polyps and corals; sea-cucumbers and jelly fishes; sea-weeds and land-weeds; chrysalids and caterpillars; lobsters and fiddler crabs; flowers and fruits;

birds and butterflies; auroras and isotherms; material enough to last for a lifetime even though that life should attain to the age of Methuselah, for

"The wish to know—that endless Thirst
Which e'en by quenching is awaked,
And which becomes or blest or curst,
As is the Fount whereat 'tis slaked—
Still urged us onward, with Desire
Insatiate, to explore, inquire."

But

"Knowledge is as food, and needs no less
Her temp'rance over appetite, to know
In measure what the mind may well contain;
Oppresses else with surfeit."

This abundant variety has resulted mainly from the arrangement whereby each member of the Club in turn presented the theme for general consideration and conversation at the stated meetings. Hence originated a series of essays accompanied with ample illustrations, each essay complete in itself, but all linked together by a bond of relationship to Natural History.

The recalling of their subjects brings back the memories of happy and profitable reunions when freely and frankly thought was interchanged, where the cares of the world were forgotten, and when, above all, a thrill of pleasure lighted up the eye as it gazed down that optic tube, that master-piece of human skill, and explored the mysteries of life and death. One after another came: The Physical Basis of Life; The Sleep of Plants; The Algæ; Lichens and Mosses; Monographs on the Graphidæ and the Hypneæ; on some plants useful to man in practical life, the Cotton Plant, the Cocoanut Tree, the Indian Corn; Thoughts on Marine Life; on Polyps and Corals; on the Sea Hedgehog (Echinus); on the Jelly Fish; Thoughts on the Insect World; on Chrysalids and Cocoons; a Monograph on the Drop Worm of Philadelphia; another on the Mantis of Baltimore; and still another on the Woodpeckers.

Besides these, the Reports of individual observations made during the summer vacation, cover a wide geographical and phenomenal field; for, notwithstanding the intense heat, most of the members of the Club obeyed their instincts as genuine Americans, and made themselves practically familiar with the geography of the country by running to and fro through the earth; and marking from car, or boat, or stage-coach, the trend of the mountains, the slopes of the hills, the curves of the water-courses, and the bountiful products of plains and valleys. The range has extended from Ottawa, the charmingly located capital of the dominion on the north, to the almost tropical climes of South Carolina; from Mt. Desert,

"An island, full of hills and dells,
All rumpled and uneven
With green recesses, sudden swells,
And odorous valleys driven
So deep and straight, that always there
The wind is cradled to soft air,"

on the east, to the flower-bespangled prairies of Nebraska, to the wide shallow affluent of the Missouri, well-named the Platte, that moves lazily along, where the startled Indian stands motionless like some bronze statue outlined against the clear sky as he gazes at the passers-by. Some found the inclement weather pursuing them even in the mountains and the lakes; others more fortunate found localities where the intense heat did not penetrate. There they revelled in the glories of the sea, laved their hands in its cool waters by day, and enjoyed with enthusiasm the phosphorescence of the night.

"How happy they,
Who, from the toil and tumult of their lives,
Steal to look down where naught but Ocean strives!"

Who

"Love to stand on some high beetling rock,
Or dusky brow of savage promontory,
Watching the waves with all their white crests dancing
Come, like thick-plumed squadrons, to the shore
Gallantly bounding."

Even on the low beach of Cape May one finds how grandly the tumbling waves come thundering in all along the beach. Starting away out in the deep blue water, they rolled, resistless as fate, onward and inward, never weary of kissing the clean sand with their foam-moistened lips.

> "Comes the everlasting ocean roaring to the land,
> Waves in wild commotion, bearing down upon the strand;
> Sweeping off forever all our traces on the sand."

How refreshing and agreeable is the wet sand to the barefooted vagabond at the shore. You can turn and look at the record you leave behind, whether it be satisfactory or otherwise. You can run down after the retreating wave to snatch some marine plant that looks like a beautiful but vanishing picture before it escapes into the deep again; you can catch a shell or curious animal, even though the brine boils knee-deep around you; yes, and you may, with bare feet, stand almost under the cresting breaker, and see and feel it curl and dash and finally break into a million watery atoms at your feet. We observed curious tracks on the fresh wet sand. Tracing one of these to its termination, we found a beetle laboring along with failing strength, but the yielding sand preserved the mark every time its legs touched its surface. A land breeze the day before had carried many insects out to sea, and becoming exhausted, they were cast back again upon the sand. And these strange marks were the tracks they had left in crawling towards dry land. They were quite different in character, as different insects had made them. This is a new standpoint from which the entomologists of the Club might view the bug subject; and to get most out of it, different species might be captured, and after depriving them of power of flight by chloroform or otherwise, turn them loose on the sand and note their tracks.

The most striking object in the animal kingdom one meets with in strolling along the sandy beach, is the jelly-fish or Medusa. These jelly-fish, with little more trace of organization in a steak cut from their side than can be found in an equal mass of sea water, do not live always in their Medusoid form. In the latter days of summer and early autumn they deposit in the restless sea vast multitudes of ova, which are minute ciliated bodies resembling infusoria; and after this event the parent jelly-fish dies and is thrown on the sand to decay. Let us follow now the perilous voyage of one of these infant, ciliated, ovarian jelly-fish. It rolls along in the boundless sea, if not devoured by whale or other creature, until the time comes for it to seek that rest which seems necessary for all creatures during certain periods of their development. Now it sinks in the water and becomes attached to rock or marine plant until the next year's sun tells it to arouse and put on its wonderful dress, for the time has come to advance into that higher state prepared for whatever has lived or is living. The little ciliated egg begins to grow and assumes the form of an ordinary polyp, attracting food by means of its ever active cilia; for now it is stationary and cannot roam the sea for its dinner. In time, transverse or circular furrows make their appearance at regular but close intervals, all round the cylindrical polyp; these polyps bear on their free external margins radiations of singular beauty. Meanwhile they deepen until all resemble a nest of animated, translucent saucers, one fitting carefully into the other. Finally, the upper saucer detaches itself from the parent polyp and floats away upon the tides of the sea, growing and sporting in all the exquisite beauty of its new-found life until its development terminates in the mature jelly-fish. Each segment of the polyp form is cast off in a similar manner, and undergoes similar transformations, so that each polyp may give origin to fifteen or twenty Medusæ by this very curious process of segmentation. Often have we seen in our plant studies that cells are multiplied by internal division, and that the ova of not a few animals increase according to a similar law; but here is an instance of an entire animal (polyp) which has lived an independent life as such, has eaten, digested, and has grown by other processes than segmentation, obeying a similar law to the vegetable cell and the ovum, though far higher in the scale.

Nor is it necessary to wander far from home to find the material for interesting study.

"On Life's current he who drifts
Is one with him who rows or sails,
And he who wanders widest lifts
No more of beauty's joyous veils
Than he who from his doorway sees
The miracle of flowers and trees."

Even the limits of a city garden furnished room enough to watch the behavior of that curiously formed and far-famed insect, the Mantis, the Soothsayer of the ancient Greeks. Imported from Maryland, probably their northern limit in the United States, they lived long enough to deposit a mass of eggs looking like some great seed-pod; and to verify for once that the female at a certain stage of existence decapitates the male, and beginning at the head gradually feasts upon the whole body. This insect indeed has a reputation alike for voracity and for sanctity. St. Francis Xavier, seeing a mantis hold up its arms in deep devotion, asked the insect to sing the praises of God, whereupon it chanted a very fine canticle. Our essayist neglected to report any attempt at verification of this habit of devotional song; therefore we think it needs confirmation. We can scarce forbear to speculate as to the meaning of that instinct which causes the female to destroy the male. Does the maternal instinct teach that a jealous husband or a hungry father will certainly devour the luscious eggs or the sprightly progeny, leaving the mother childless, and so reduce her to the horrible dilemma of slaying one for the preservation of the race?

A walk along our busy streets or by the hedge-adorned homes of West Philadelphia gives ample opportunity for making acquaintance with some habits and habitations of our too common Drop-worm, and to suggest an explanation of what at first seemed inexplicable, that follicles thatched with arbor-vitæ leaves were observed hanging from the twigs of a maple tree, when the nearest arbor-vitæ was distant about thirty feet. On one occasion, a larva having nearly completed his house in the locality where he found fitting material, was occupied in transferring it to the locality where he wished to spend his follicle life.

But the richest study, that most fertile in discovery and suggestion, that which cannot be communicated by words alone, that which must be seen to be realized, requires not even a city walk nor the narrow limits of a city garden, only space for a microscope, with its delicate accompanying apparatus, and the tiny objects for inspection. Who of us can ever forget the impression made upon the mind in first witnessing the various and varying forms, the rapid evolutions, the agile movements of some of the Infusoria and Animalcula; or in tracing the analogies of ciliated and zoosporic motion; or of the circulatory organs and circulation of the plant and the animal? We are lost as we wander along the borders of a seemingly intermediate kingdom, whose inhabitants present so dubious a character (if a drop of jelly can be said to present a character) that we know not whether to address our fellow-creatures as, "Ye animals!" or "Ye plants!" So similar are these simple forms of life, that we must apply other tests than that of eyesight to differentiate the Amœbæ and the Monera. Time, however, never fails to develop from the jelly spot the life, be it plant or animal. So, baffled, we pass on to more decided forms such as the common but minute Protococcus viridis, a simple cell reproduced by cell-division, clothing the trees with brilliant green on these moist autumnal days; or to the more complexly organized Verrucaria, a crustaceous lichen, which had almost covered the piece of sandstone on which it grew; whose mycelium, penetrating the hard stone, is one of Nature's earliest rock disintegrators. A lighter color in the stone marked the extent of the thallus on which the apothecia appeared as tiny black dots arranged in concentric circles. A vertical section of one of these apothecia showed them to be raised and rounded bodies, perforated by numerous small openings, and showed also the spores in their cases, and, magnified five hundred diameters, the nucleoli and little oil-globules within the tiny oval and pointed spore. Still more interesting did we find a lichen growing on some fragments of bark chipped from the forest tree. Belonging to the family Graphidæ, this humble cryptogam, this lichen spot is so intimately blended with the vegetative structure of the prouder phænogam that we cannot draw the line between them. All over these faded-looking spots on the bark are engraved, like mysterious letters, trivially called "Scripture-wort," dark lines curved, branching, and irregular. These are the apothecia; the gray spots, the thalloid patches. Only a few gonidial cells, imperfectly differentiated, were found on examining a transverse section of the thallus. These cells, measuring $\frac{1}{1000}$ of an inch, and imbricated in fifteen separable layers, numbered 15,000,000 in each square inch of thallus! How strange and mysterious these black lines look! Moreover they are very ancient; for these hieroglyphics of the forest were written before man had yet come upon the scene; the weird types were set away back in the structural activity of the primeval forests with ink so indelible that all the storms of uncounted centuries have not erased them from the trees. Illegible are they to the woodman who fells the forest giants, yet "I have found the Rosetta Stone that will help to interpret their significance; the microscope is that Rosetta Stone, and it stands before us to-night marvellously perfected." The spores of this Graphis measure in longest diameter only about $\frac{1}{500}$ of an inch; in shortest, about $\frac{1}{2000}$; they are pale-green, nucleated, animated, vegetable atoms, by whose side a mustard seed would be a Mt. Washington among mole hills. Nor would it be easy to get possession of these little atoms were it not that this Graphis, in common with many fungi and lichens, is hygrometric, so that when wet the paraphyses swell and force the spores out of their sacs. If a drop of water is let fall upon the apothecia, the spores will be ejected and may be carefully collected on a thin glass. Other organs than spores and paraphyses, thallus and gonidia are concerned in the reproduction of this tiny growth. Minute points on portions of the thallus indicate the position of the spermagonia. These supposed analogues of the anthers in the higher plants are lined with delicate filaments imbedded in a transparent jelly. These filaments are septate, and give off showers of little rods or joints about $\frac{1}{50000}$ of an inch in length.

Leaving the humble but ancient cryptogam, we have explored some of the elementary characteristics of the cells, the fibres, the glands, the hairs, the pollen, the seed, and circulation of the phænogams. Fresh in the memories of all, we can but refer to them now, and recall in a few words the observation made on the young life, development, and premature death of an infant mountain trout. An egg in which the embryo had advanced enough to render it quite visible, as it lay coiled up in the translucent membrane, was placed under the microscope. The head, with prominent eyes on either side, developed in advance of the other parts; and dimly could be traced through the membranes, the arteries and veins, carrying their crimson tides from organ to organ. The problem to be solved was, "*How* will this baby-trout release itself from its ichthyological cradle? The embryo seemed long to slumber; then a little rip in the outer membrane just over the head of the young fish, showed why the head was first to develop in the egg; the crack grew rapidly larger, whilst the fish using its head as a hammer, thumped against the fissure until it struck through and was fairly on the outside. In ten minutes the imprisoned embryo had performed a complete evolution, was now on the outside of the egg, whose large yolk-bag remained attached to its abdomen, and floated in the water. When hatched, the young trout lies motionless in the water for an hour or two, with its fresh tissues quite transparent. In the yolk-bag, destined to become finally absorbed into the fish, could be seen numerous oil-globules, the diet of our little ichthyophite. The circulation of its young blood was a vision not soon to be forgotten. All over the yolk-bag the blood poured in tortuous channels, each oval globule clearly mapped out in the vessel, and the margins of artery and vein sharply defined as they passed over the highly refractive oil-globules. There was the vena cava collecting the blood from numerous conveying veins, the tide hurrying impetuously along to be poured into the auricle, the auricle contracting and driving the blood into the ventricle, the ventricle impelling it still a step forward, into the branchial artery, then the current rushing around the gills in graceful curves, to be taken up by the aorta, and carried to all parts of the transparent body. A beam of polarized light sent through the fish revealed the rudimentary vertebræ still cartilaginous, and the extreme beauty of its muscular system, bands of striated fibre and the contracting and expanding fasciculi, cording all the parts together. The nicest critical analyses do not interpret the mystery of life, that force which drives the busy wheels of organization. A few drops of concentrated solution of potash were added to the water in which the trout was floating, and the result watched with keenest attention; the density of the water was increased; the blood currents halted just a little; an alarm of impending danger ran through the whole organization; then onward they rushed; then paused again. A languor crept in among the globules, which seemed to take counsel together; the tide ceased to move; only a slight shudder ran through the muscles, and the trout was dead. Nothing visible went out of that fish, for the clear lenses embraced every atom within their penetrating vision, and yet the crimson couriers stood still, never again to don the harness we call life, and gallop round their tracks. What change had taken place in the fish?"

With all the aids that human ingenuity has devised, can the student of to-day advance one step beyond the mere fact recorded in the Pentateuch, that "the life is in the blood;" or express more clearly their sense of the frailty of life, than did the apostle James, when he exclaimed: "Life is even a vapor that appeareth for a little time, and then vanisheth away." It is worthy of remark that the word here translated *vapor* is derived from a very simple root verb, meaning "to blow," "to breathe." This root expressed by the two vowels (῎ΑΩ) which represent the first and last letters of the Greek alphabet, α, ω,—and itself derived from the more ancient Hebrew language, thus pictures forth in one little word, the beginning and ending, the life and death, of all the mortal habitants of earth.

Thus have we gathered in the harvest of 1872. Joyfully have we worked together in our social organization, joyfully save when our day was darkened by that eclipse which sooner or later must cast its shadow over every circle and every human being—death.

"Six years of success and of failure, of triumphs and of defeats, have been passed together, and the roll-call has been broken only by the optional resignation of members," whose removal from the city, or whose want of leisure to engage in loved pursuits, obliged them to withdraw from the Club. One of these, the late John G. Moore, whom we valued as an enthusiastic worker in the domain of natural science; an earnest, successful teacher; a modest, upright and noble man, ceased from his earthly labors last April. "But for the first time in the history of our little Club, a black mark stands upon our roll-call; a vacant place is felt at our table." Just when the beautiful spring flowers she so loved to study in our company were coming into visible life, Dr. Ann Preston passed away from among the living. That which we knew and loved as our fellow-member, we shall never see again with our present senses, and as we sit here this night, dimly realizing this momentous and solemn truth, I utter the feeling of the Club when I say we are all mourners. But is it an evil thing to mourn? Is sorrow so altogether sorrowful that no harvest can be gathered from its stubble? We need the ministration of sorrow to deepen our appreciation of solid joy; we need possibly to wear the heavy garment of bereavement, before we can live a purer and a higher life, in which faith in better things shall remain with us after all else shall have passed away. To know a human mind—that is one worth knowing—I esteem among my great privileges. Dr. Preston was distinguished by the possession of large intellectual gifts, allied with an incorruptible morality which neither place nor appointment could pervert, and which commanded or won respect from all classes, even from those who differed widely from her in the main work of her life. Added to these gifts was a charming ideality which elevated her far above the merely real in life, and which also added an indescribable charm and embellished all her earnest work. Dr. Preston was characteristically liberal in her interpretation of the facts and incidents of human life. A philosophy broader than that of any sect identified her in thought and in aspiration, if not in life-work, with all who longed for the realization of a better life. Before all mere intellectual attainments, it was her object so to discipline her mind as to arrive at the full recognition and philosophical acquiescence in the inevitable tendencies and results of things. On all serious subjects, I found her ready to accept the demonstrated facts of physiological science, and without superstition or bigotry, not suspicious of ulterior or final results, provided only that it was the light of *truth* that fell across her pathway.

Her nature was so organized as to be capable of continuous growth, but her culture was too strictly disciplined by inductive science to venture into regions entirely beyond the comprehension of human faculties. Her faith, in its very simplicity, was unspeakably sublime.

In life, Dr. Preston was successful. When a lone woman, by mere ability of worth and merit, and without speculative hazard, earns and maintains an independent position in modern society, she is indeed successful. *That* our member did by the pursuit of her profession, when for a woman to enter the profession at all was considered hazardous or at least experimental.

Dr. Preston was prominent among those who first advocated medical education for women, and at a time, too, when such ideas had a different significance from what they have now. Liberal and advanced in her views and culture, her teaching as a Professor of Physiology to women embodied a fair and faithful exposition of the science as now understood by the regular profession; and her sympathetic kindness and high honor as a physician secured her numerous patients, and won her many friends, while at the same time she commanded the respect of the worthy and prominent among the educated physicians of our city and country. But to have done all this, with innumerable other official and social duties, proved a burden heavier than her organization could bear. The gifted ones among us have a fatal facility for overwork. The intellectual man or woman is the only real worker in the world. When fatigued the muscles that have pounded the anvil all day may rest all night; but who shall calm the wild waves of that cerebral storm that lash with wildest frenzy the victims of overwork? Death comes as the proper and inevitable result of organic change in a body no longer capable of manifesting the phenomena of life. And can we call this an evil?

When we are compelled to arrange the silent drapery of death around one we have loved, our emotional nature, of course, is deeply stirred; but after the storm shall have passed over, if better thoughts and a purer life enable us to gather flowers of immortal fragrance and beauty from the soil we have watered with tears, our compensation is great, and we can live henceforth in closer harmony with nature, and recognize more clearly the conditions on which we enjoy for a time all good and beautiful things of life. Truly we are called to a high culture *even in this life*, and need all the helps we can obtain; but as humble children, sporting in the great suggestive nursery of life, and as loyal students of science, we must learn to see all things in their true light, waiting in sublime patience just at the line where knowledge ends. But we do gather this lesson from a proper study of all living things, that every organization, by virtue of some general law, is advancing towards a higher manifestation of life; and it is not at all probable, therefore, that man gifted with distinctive faculties forms the only exception to the rule. If, therefore, in other conditions of life, probably impending for all, we shall obtain faculties differing in nature from the present, and needing higher and other compensations for their full exercise and growth, we may sweetly rest in the hope that our condition will be unspeakable and full of glory.

"So death becomes
Man's final remedy; and, after life,
Tried in sharp tribulation, and refined
By faith and faithful works, to second life,
Waked in the renovation of the just,
Resigns him up with heaven and earth renew'd."

Happily we are not shut up to the conclusions and probabilities of the scientist; for, wide and glorious as is his sphere of observation, it is not his to mount into the higher sphere of mind and spirit, except as these are incidentally influenced by matter. With all his reasoning, the acute and nature-worshiping Greek never attained to the knowledge of the resurrection of the dead, till Paul, the eloquent, drawing his illustration from the processes of germination and growth in vegetable life, authoritatively taught that "the body, sown in weakness, is raised in power; it is sown a natural body, it is raised a spiritual body: and when this mortal shall have put on immortality, Death is swallowed up in victory." Happy they who have this well-grounded "faith, the evidence of things not seen."

During one of the last conversations I was favored to have with Dr. Preston, in the library so well known to us all, she expressed a hope mingled, however, with much doubt, that her health might be sufficiently restored to enable her to devote two or three years longer to her profession. I asked: "But if this is denied you, can you not find great satisfaction in realizing that you have accomplished for your sex, and for the general good, more than any other living woman has done?" A radiant smile lighted up that pale face as she answered with childlike and earnest simplicity: "When I commenced life, I never purposed such a work. I only followed as I was led." Thus shortly before her death did she testify her obedience to the still small voice and to the divine guidance.

"Here in the quiet earth, they laid apart
No man of iron mould and bloody hands,
Who sought to wreak upon the cowering lands
The passions that consumed his restless heart;
But one of tender spirit and delicate frame,
Gentlest in mien and mind
Of gentle womankind,
Timidly shrinking from the breath of blame;
One in whose eyes the smile of kindness made
Its haunt, like flowers by sunny brooks in May;
Yet at the thought of others' pain, a shade
Of sweeter sadness chased the smile away.

Her soft hand put aside the assaults of wrath,
And calmly broke in twain
The fiery shafts of pain,
And rent the nets of passion from her path.
By that victorious hand despair was slain.
With love she vanquish'd hate, and overcame
Evil with good in her great Master's name.''

SIXTH ANNUAL REPORT

OF THE

Natural History Club of Philadelphia.

BY

DR. J. G. HUNT.

Read December 10, 1873.

PUBLISHED BY ORDER OF THE CLUB.

PHILADELPHIA:
COLLINS, PRINTER, 705 JAYNE STREET.
1873.

SIXTH ANNUAL REPORT

OF THE

NATURAL HISTORY CLUB OF PHILADELPHIA.

1873.

We greet each other, this evening, my fellow-members and friends, on the sixth anniversary of our little Natural History Club. Animated by one common impulse, and anticipating only our usual compensation of moderate social and intellectual pleasure, I will endeavor to make a rapid retrospect of some thoughts and work which have occupied us, at times, during the year.

It is not my intention to offer apologies, nor to indulge regrets, because the amount of work we have done is small. Those qualified for the work by natural organization, and who are, at the same time, liberated by fortune's favors from the estranging routine of daily life, must still be the messengers who will bring truth from the bottom of the well. We drink only the pure cool water which overruns from its lips.

Every year natural science is widening her domain. Already her outstretched hand weighs the planets in its palm. With an analysis, which is sublime, she tells us what chemical elements feed the ever-blazing furnace of the sun. She numbers the nightly hosts of the steadfast stars, and follows with telescopic eye, or with keener thought, those wild wanderers of the limitless heavens—the comets—who go so far away, and are absent so long, that scores of generations of men pass from the earth before they return.

The kingdom of organized beings embraces for our study a closely-linked and allied chain of forms extending, by two parallel pathways, one vegetable the other animal, from living units so small that millions could swim without crowding, in the smallest tear-drop, up to and including man; and yet each one of these organic atoms is endowed with every essential attribute of what we call life, viz.: sensibility, contractility, nutrition, and multiplication.

May I ask if this horizon is not wide enough? Yet it is not. What is the true significance of the magnitude and grandeur of the physical creation? To grasp even its visible proportions in one vigorous intellectual conception, surpasses the ability of the most gifted among men. We exhaust intellectual energy in its contemplation, but feel a want still unsatisfied, still an eternal longing for some final cause for all this display. The scientific mind of to-day accepts the idea of an omnipresent ether, itself invisible and imponderable, and known to us only by its phenomena, as light and heat, and other forms of motion, and we can give no positive demonstration of its existence except those phenomena. This great physical fact is absolutely taken for granted in order to explain those phenomena. The same scientific mind, in order to satisfy its eternal and natural craving for a final cause, and trained moreover in the habit of estimating cause and effect, accepts with equal assurance the far grander and more momentous fact, and equally beyond our clear comprehension, that omnipresent mind pervades and co-ordinates all things. In view, therefore, of man's intellectual magnitude when compared with that of other animals, and, moreover, of his eternal longing for a final cause, a longing, native and organic in every race, the grandeur of physical creation became a necessity. I speak thus not for apology, but for justification of the loyal student of natural science, because a minority of right-meaning but wrong-thinking people, who have inherited or acquired the theological bias of mind, are doing bad work in creating antagonism between those who would pursue the absolute truth. "Truth fears nothing which can be proven true. It holds no cherished doctrine that it will not have searched and scrutinized through and through; tested by every ordeal, exposed to the light of every science. Least of all, can it permit unreasoning religious dogma to disrespect the autonomy of personal conviction."*

The pleasure we have all felt in our Club studies during the year has been associated with a sense of conscious growth in a fuller understanding of things. To cultivate the habit of direct observation on natural objects, before resorting to books in which the observations of others are recorded, has been the primary idea of our organization, and we have found it to be the best or only method of efficient self-instruction. Six years before the generosity of an Anderson made Penekese possible, our little school, in grateful obscurity and without public demonstration, was studying the elementary chapters written in the great volume of life and of organization; and when I report twelve members as the average number at our meetings, no abatement of interest is manifest.

Membership in the Club fixes responsibility and places each one under obligation to contribute some matter of interest, as his or her name shall come in regular alphabetical order. The advantages of this plan are too obvious and too essential not to be acknowledged by all, and without its literal observance, except as provided for by rule, an equal division of labor and profit cannot be realized.

The custom of appointing committees to report on special subjects has been advantageous, and might be rendered more so in the future. From the report of a special committee the subject of phosphorescence and of our fire-flies was brought before the Club.

According to Say, the *Lampyris pyralis* is our common summer fire-fly. "The female differs from the male in having the elytra imperfect, they are, however, margined like those of the male. But do this fire-fly and the glow-worm belong to the same species? We think not. Fire-flies make their appearance in this region in May; last year they were seen on the 21st. They are abundant in the middle and latter part of June, and few are to be seen at the end of September. But during May, June, July, and early in September the light of the glow-worm is not to be seen with us; we therefore think there is another species to which our glow-worm belongs. These insects conceal themselves in daytime and appear at night. The light which they emit is periodical, and it is this phenomenon we call phosphorescence. It is probable that most substances in peculiar conditions may become phosphorescent. Among minerals, lime, fluor-spar, and Bologna stone have been seen to glow with light.

---

* President Winchell, Syracuse University.

"Not only do flowers breathe perfume on the evening air, but the daughter of Linnæus discovered in 1762, that the garden Nasturtium flashed sparks of light from its petals in certain moist conditions of the atmosphere in June. Fungi often glow in the dark with phosphoric light, but in all emissions of such light, it appears to be unaccompanied with heat.

"The cause of phosphorescence is not understood. Many theories have been offered in its explanation, but, of those special molecular changes which give origin to the phenomenon, we know absolutely nothing. That it is altogether distinct from what we call life, is apparent from the fact that it is frequently manifested by inorganic masses. Our ignorance in regard to this manifestation of light lies in the obscurity of the conditions in which it occurs, rather than in the nature of the light itself. For the properties of ordinary light, such as reflection and refraction, polarization and spectrum analysis, appear to belong equally to phosphorescent light." Chemistry offers us Noctilucine as a "special organic substance widely spread throughout the world of nature, and which shines like phosphorus." This Noctilucine is supposed to be the cause of the phenomenon under consideration, but we still ask, why does Noctilucine become radiant or visible? In all our searching for final causes, it is no disappointment to be baffled, we remain partially content to accept words as the nearest approach to the unattainable truth.

Subjects widely different in character and interest have been before us at the several meetings of the Club. I can pause in this rapid review to record only those which have embodied most originality, or have presented facts not so readily obtained elsewhere.

"Out on the flower-spangled prairie, one hundred miles west of Omaha, and in other places too, live the little prairie dogs, the *Spermophilus Ludovicianus* of Ord. This dog-town is older than Omaha, or San Francisco, or Chicago, or Cincinnati. The first white pioneers in these sublime prairie solitudes found them coexistent with the wild buffalo and the Indian not less wild. Differing from these, their natural companions, they are colonized in spots, while the others rove the land at will. A leisure drive through this dog-town, revealed a little, the habits of this peculiar people. As far as the eye could reach on either side could be seen the little creatures, hopping about, standing erect on their mounds, or skirmishing hither and thither."

"The prairie dog is a burrowing animal, occupying a link between the squirrel and the marmot. The burrows are made often at an angle of forty degrees for a short distance, then run horizontally or rise towards the surface. The mound itself is a truncated cone, two feet wide at base, and seldom rising more than eighteen inches above the soil, with the entrance either at the top or on the side, and beaten down externally, resembling a much-used foot-path. The village is entirely honeycombed with such mounds in close proximity. Seated on many of these mounds were stupid-looking owls, little and gray, like sentinels of lapsing time, undisturbed at our approach. This owl, according to Wilson, is the *Strix canicularia*. Its note resembles the cry of the prairie dog, and instead of sailing forth heavily in the obscurity of the evening, it enjoys the broadest glare of the sun, searching for food in the cheerful light of day. The idea is generally maintained that the dog, rattlesnake, and owl inhabit the same burrow, but from a close observation of three years among them, we are convinced that this is false, and that the snake occupies only the deserted holes, and, moreover, as the snake is a deadly enemy of the dog—often feeding on their young—it is not reasonable to suppose such is the case."

The custom of reading at our Club-meetings extracts from authors has been practised more frequently in the past year than during former meetings of the Club. Additional information is obtained in this way on subjects foreign to our own observation or in support of our own views, but such reading should not come in place and as a substitute for original matter.

The life of our stated meetings consists in the results of direct observation on whatever is beautiful or new to us in the natural world, and the fact that others may have anticipated us in the work lessens neither the profit nor the pleasure we derive. Facts are not, perhaps, of greatest value in science after all, but that sense of growth in intellectual power which results from systematic and vigorous use of every faculty, robing the student in a mantle of light, and ordaining him to be something more than a mere fact-registering machine, even to become the inspired interpreter of the beautiful and true for all who have ears to hear.

The forces concerned in crystallization and in the complex organization of plants have interested us at times during the year. The imagination may conceive the play of polar force which can aggregate the molecules of matter into the glittering crystal, the sparkling and coveted diamond, or moulds the myriads of flashing stars in the softly-falling snow. The life force which builds a seed, arranges its molecules also according to a law as unvarying in its results as the polar force which builds the crystal. In the seed its structural boundary lines are curves, in the crystal straight lines only form the angles. "If a beam of polarized light be sent into the crystal it reveals with more or less clearness how the molecules are arranged, when a grain of corn in section is examined by similar light chromatic phenomena not dissimilar from those noticed in the crystal are observed. In either case the molecules are not amorphously self-posited, but are built into definite forms, by a force whose results manifest some phenomena of intelligence. Placed in the earth, and kept by the same force in that condition of agitation we call warmth, the grain and substances which surround it interact, and a definite molecular architecture is the result." "A bud is formed, and reaches the surface, exposed to the specific motion of the sun's rays, the now green bud is enabled to feed upon carbonic acid and the aqueous vapor of the air. Forces are active at the root, forces are active in the blade, the matter of the earth and the matter of the air are drawn to the root and to the leaf, and the plant augments in size; completes the cycle of molecular action by the production of granules similar to those with which the process began."

Is not this picture of the silent grouping of the organic molecules, a grouping going on all over the earth, astonishing in its very silence, and sublime in its results?

In the contemplation of such phenomena, man's most serious and higher life is appealed to, and he feels that himself is one with all things, and that a chain of brotherhood links him to every organization beneath the sun.

"The beat of a pendulum occupies only a second of time. Divide that period into a million of equal parts, then divide each of these brief periods into a million of other equal parts. A wave of yellow light during one of the last small intervals has vibrated five hundred and thirty-five times. Yet that yellow light has been the chief instrument in building a tree. In the delicate texture of its leaves it has overcome molecular force; it has beaten asunder the elements of an invisible gas, and inaugurated a new arragement of atoms. The old dragon tree of Teneriffe represents forty centuries of this dynamic work—a sublime monument reared without toil, by the silent forces of nature. In the outer air it has awakened every note of sound, from the softest monotone to the rhythmic roar of the tempest, but in its inner chambers has been a murmur and music of life, in the ceaseless movement of fluids and marshalling of atoms, as one by one they take their place in the molecular dance, which eludes the dull sense of hearing, and becomes obvious only in results."*

A member of the Club brings a contribution illustrating the habits of our humming-bird, the *Trochilus colubris* of Wilson. This smallest of our birds appears in Pennsylvania about the 25th of April, and seldom remains with us later than the middle of September. Its voice, not noted for melody, is only a chirp, resembling the note of the cricket, while the humming is made by the rapid vibration of powerful though minute wings. The sternum of this little bird is very large in comparison with the body of the bird, and this allows ample attachment for the thoracic muscles, fitting the creature for rapidity of flight. Its nest, constructed of lichens and moss, and woven together with hair or bits of thread, is equal in size to half an ordinary egg-shell, and only two pure white eggs, equally large at both ends, are all we find within this minute specimen of forest architecture. It is an error to suppose that the humming-bird subsists only upon the sweet exudation in the flowers; much more probable is it that insects which have been lured by the honey of the plants, form the diet of the bird, for such insects have been found in its stomach after dissection.

---

* Professor Draper.

A few of the nuts which are used as food by omnivorous man have been objects of study in the past year. "Most common and, perhaps, coarsest of our domestic nuts is the black walnut, *Juglans nigra*, the nut of Jove of the Romans. It is supposed to be native in Persia, and is probably the 'Persian nut' mentioned by Theophrastus. The variety *cinerea*, butternut, has oblong fruit deeply carved with ragged edges. The richer and sweeter *Juglans regia*, the English walnut, has never become naturalized here. The walnut grows rapidly and attains full size in about sixty years. In some parts of Germany there is little other timber, and it is supposed to have been introduced into England from France previous to 1562. When the leaves and husks are macerated they yield a juice which stains the skin a persistent brown color, and it is said the gypsies of Hungary use this liquid in the transformation of stolen white children into gypsy children. The hickory, shellbark, and especially the pecan nut, all from the genera *carya*, are palatable and nutritious, and with the walnuts, contain large amounts of oil, which has been serviceable when eaten in early stages of pulmonary disease. The chestnuts, genus *castanea*, are natives of Asia, though now found growing over large parts of the earth. In some provinces of France and Corsica chestnuts form the principal food of the poor; they are ground into flour and made into bread—less nutritious, however, than wheat bread. Another important home nut is the hazel-nut or filbert, genus *corylus*. The catkins of this plant appear in September on the shoots of the previous year, but are not fully developed until the following February, when the staminate flowers appear.

The *Bertholletia excelsa*, Brazil nut, or cream nut, is one of the mort extraordinary fruits of South America. The tree which produces this nut is a palm, and though only two or three feet in diameter, it rises to a height of 120 feet. "No other production of the torrid zone can give a more forcible idea of the power of vegetable life in those regions, than these enormous ligneous pericarps. In fifty or sixty days a shell is formed half an inch in thickness, which it is difficult to open with the sharpest instrument. Four, five, and sometimes eight nuts are attached to a central membrane. The fruit, in falling from a height, is generally fractured, and the monkeys and the natives vie with each other in activity in gathering it. Nothing can exceed the elegance and economy of the arrangement within this outer shell."* The members will recall the demonstration, and will not quickly forget this and many other recollections which remain as fruits of our humble Club studies—as nuts which we have cracked, or roasted in the glowing coals of our united thought.

You would not pardon me if I were to pass over in silence our Club-visit to the sea. The coast at Atlantic City is not remarkable for the richness of its fauna, nor the beauty of its flora; yet we found in the personality of the ocean, in its immensity, in its sublime representation of force, and in its tumbling breakers, and racing and vanishing white-capped waves, its marvellous gradations of color, ample compensation for a day spent on the beach. Our sail beyond the inlet, out on the swelling waves, now lifted on their curling tops, then plunging into the trough of the boiling sea, until cheeks grew white and unwonted silence crept over the crew—a silence

* Humboldt.

enforced, perhaps, by a full perception of the wild beauty and sublimity of the situation, perhaps by other causes—some members will recollect. Our white sail wafted us, too, into calmer water, up among the oyster beds, where enthusiastic men were wading about like flamingoes, gathering the oysters into heaps before sending them into market. New sensations, novel and fresh emotions, are as precious to the student as new species of animals, or plants which are yet undescribed. I will not say that we have too many registering machines in the world of science, but I do think if we had more tongues to tell the thoughts which cluster around our vivid perceptions of the beautiful and the grand in nature; if we had more interpreters of those deeper emotions which sometimes stir the soul as the tides stir the sea, our lives would be richer, because the finest results of scientific work would be thus addressed to the general public who could appreciate such compensation, but who cannot estimate the severer facts of science.

On the beach, still wet with the retreating tide, only the green ulva, polysiphonia, and callithamnias much broken by the waves, rewarded our search. But a creature some higher in organization than these plants, contributed its share of satisfaction to the Club. A living "squid," belonging to the cephalopod mollusca, was found in the wet sand. Portions of its body, on being touched with the finger, rapidly changed in color from a rosy tint to paler white. The skin of this animal, although quite dense and firm as a protective covering, is nevertheless movable and easily a little displaced by pressure. In fact it seems to be composed of layers of elastic tissue, contractile perhaps at the will of the animal. In a layer of this skin just beneath the surface were innumerable bright and carmine spots—the so called chromatophores. These pigment-cells are contractile, and present very different forms. From round or oval outlines they give off numerous prolongations, retract and radiate in many directions. These alterations in form and color may be observed in a piece of skin taken from the living creature and placed under the microscope. Its two curved and strongly developed jaws, resembling those of a parrot, and its one transparent bone extending the length of the body, its curious ink-sacks filled with colored liquid, and eyes attaining a fuller development than in any other order of mollusca, were studied in detail by the Club. But most interesting of all were the beautiful and curious suctorial disks arming its tentacula. Each disk is a thick fleshy, adhesive organ, circular in outline, and has developed in its circumference a thin, bony, serrated ring, armed with sharp, short, and curved teeth, while strong muscular fibres radiate towards the central cavity. This cavity descends into the tentaculum of the animal, and contains a conical projection of elastic tissue, like the piston of a syringe. "When the sucker is applied to a surface for the purpose of adhesion, this piston, having been previously raised to fill the cavity, is retracted, and a vacuum is produced, which may be still further increased by retraction of the plicated central portion of the disk. So admirably are these air-pumps constructed, and so tenacious is their grasp, that when they have once seized their prey, it cannot possibly disengage from their murderous embrace."*

The important subject of respiration, in both its types, aerial and aquatic, with the diversity of organs set apart to accomplish this vital function in both invertebrates and vertebrates, has been a subject of study in the Club during the year, but I cannot linger in this report to gather up even the cardinal facts or to recall the demonstrations. This, with much other profitable matter, must be relegated to the custody of recollection, my office being only to call up, perhaps, forgotten memories, or to select a few facts from the unclassified past, and to arrange them, like flowers in a bouquet, that their fragrance may be more enduring, and may remain for our refreshment and delight.

The diversity in pursuit and taste always to be found in a number of thoughtful people, has brought a corresponding diversity of subject before the Club. The insects which sport in beauty in the summer sun, or chase their retreating prey on wings more agile and vigorous than those of the eagle in comparison of size, and with a volition so savage that its gratification seems the only object, have been subjects of study at our past meetings. The order *Neuroptera*, with some history of its transformations, illustrated with natural specimens remarkable for brilliancy and richness of color, has been studied. The genera *Agrion* and *Chrysopa* are not excelled in beauty, perhaps, by any other insects, and such colors as tint their wings are not mixed on painter's pallet; like flashing sunbeams playing among flowers they flit among the green leaves where the green aphis lives, and "well they know how to empty his soft fat body, at the rate of three in half a minute."

---

* Hartwig, "The Sea and its Living Wonders."

"About the first of July the *Orgyia antiqua* or vaporer moth was observed devastating the maple leaves in the squares of our city. The caterpillars of this moth do not associate in colonies like others of their order, but are independent, each being able to take care of itself. About the middle of July they descended from the trees in great numbers, swinging from the branches and stretching a silken cord to the ground; then, after crawling up posts or trunks of the trees, commenced their cocoons, which they formed of whitish silken threads woven so loosely that the inclosed chrysalids could be seen through their walls. Hairs derived from the caterpillars themselves were used in constructing these cocoons. Most of them were placed on the trunks and under sides of the limbs, and even under the benches and railings in the square. While in the cocoons they were often attacked by the ichneumons, and it was interesting to watch them moving with restless energy among the cocoons; now and then pausing for a moment over one, it would dart its long and slender ovipositor into the unsuspecting chrysalis, and then with utmost unconcern continue its search, leaving its victim writhing in agony, but which, after a time, quieted down to doze away the remainder of its short existence, for the parasitic egg hatches early, and feeding upon the fatty matter of the larva soon exhausts its energies. About the first of August the moths made their appearance: the males were not readily discovered, as they lay close against the bark of the trees, which they nearly resemble in color; but the females were more readily found, and upon nearly every tree and post were seen multitudes depositing eggs. The wings of the females are rudimentary, and can scarcely be seen when alive; they therefore cannot fly, and merely crawl from the inner to the outer side of their cocoons. The eggs are placed on the outside of the cocoon from which the insect came, and are enveloped in a large quantity of viscid whitish matter, which glues them to the cocoons, and hardening by exposure, protects these curious nests from the storms of winter.

"The sparrows in the square did not eat these caterpillars, probably on account of the numerous hairs which cover their bodies, and which discharge an excretion quite irritating to delicate skins."

In our study of parasitic plants we entered a field presenting many anomalies of form and habit, but so rich and uncultivated that future work only will prepare the soil to bring forth a harvest most profitable to the Club. Without much further study we may not even speculate upon the significance of parasitism in the vegetable kingdom, and while we see the fact we can describe only the isolated phenomena. If we make a fine transverse section through the stem of a rubus, around which our common dodder has wound its golden parasitic threads, we may see the structural elements which come in contact. I am a convert to the belief in the necessity to see all visible structural elements in any organization before venturing to explain function. The dodder grasps the rubus by coiling its stem snakelike around it. The surface of the dodder thus brought in contact with the rubus is differentiated into columnar cells with delicate walls, the $\frac{1}{500}$th of an inch in length, and fitting with graftlike accuracy the outer row of cells in the bark of the rubus. This union of the parasitic cells with those of the rubus is so intimate that a cementing substance is developed between them, and the line of contact may be stained like the lines of cell-contact elsewhere. The bark cells of the rubus are not destroyed by this contact, but remain active and reveal their usual thickening deposits within.

At other points of contact the hungry parasite breaks through these columnar cells in its own tissue and thrusts nail-like processes or roots through the seven or eight rows of firm bark-cells of the rubus quite into the pith. The entire fibro-vascular bundle with its investing thickened cells is carried in this way among the succulent cell structures of the plant on whose sap it feeds, getting thus probably a doubly sure and doubly necessary supply from the cells of the bark by means of its own columnar cells, and from its rootlike fingers, which tap the life-currents of the rubus at their central fountains. The tentacles of the mollusk we studied a little while ago are not more wonderful, though of different function, perhaps, than these suckers of the dodder. Softer at first contact than an infant's finger, they press steadily on until, by a process of growth, the parasitic cells creep in among those on which they feed. If art could imitate more closely this natural grafting of the vegetable parasites it might become possible to rear on one common stock more varieties of plants than we now think possible. All efforts to cause the dodder to adhere to cryptogams have been fruitless; it is probable, therefore, the sap of flowering plants only can give it nutrition.

In the interesting department of special microscopic work, the members of the Club have not been altogether idle through the year. An algæ, not before recorded in our flora, to my knowledge, was detected last July in the basin at the Camden waterworks, New Jersey. On examining this water microscopically, I found it saturated with a plant belonging to the *Nostochaceæ*, diffused in gelatinous masses of an opalescent faint olive-green color.

These jelly-like masses were much broken up, indeterminate in form, and they enveloped innumerable spiral and brittle filaments, each having from three to fifteen turns. Cells of two kinds make up these filaments. Several subquadrate cells, about the $\frac{1}{2000}$ of an inch in diameter, are arranged in linear series; then, at regular intervals, globular cells—perhaps heterocysts—of equal size as the other cells are interposed. All the cells are filled with granular contents. Owing to the extremely brittle character of these filaments it was impossible to tell how many spirals completed an adult plant. If placed in pure water all the cells became quickly separated, and the ripest exploded like miniature bombs, scattering their granular contents all around. This made it very difficult to preserve a specimen unbroken, but the difficulty was overcome by using a medium of glycerine, alcohol, and water, nearly the specific gravity of that belonging to the plant. It is possible this is the same plant Mr. Thompson found in Lake Ballydrain, near Belfast, Ireland, and described in *Mag. Nat. Hist.* for 1837, as *Trichormus Thompsonii*. His figure is rude, and fails to give the character of our plant clearly.

It is characteristic of the *Nostochaceæ* to increase with great rapidity under peculiar conditions. During June, this year, little or no rain fell on the Camden basin for nearly thirty consecutive days, and the sun shone with almost unobstructed power on the still surface of the water. These are all the known conditions which marked the appearance of this curious plant at that place, and if our ignorance of cause and result forbids speculation reaching beyond ascertained facts in similar cases, we may, nevertheless, smile with distrust or commiseration at those premature pseudo-scientific conjectures which find causes for the origin of things in regions beyond our clear comprehension.

By help of new processes of demonstration, not practised elsewhere, we succeed in dispensing largely with the necessity for dissection, and are thus enabled to demonstrate many delicate structural arrangements in all their natural relationship of parts. The crystals, raphides, and cystoliths, scattered so abundantly in plant tissues, and whose significance we cannot yet read; the delicate and beautiful special cells for holding the aromatic or essential oils in many fragrant plants, we can now study in all their marvellous perfection without mutilation or structural change. The recently-discovered absorbent organs, located in leaves at the terminations of the veins in many cases, and which Herbert Spencer demonstrated only after elaborate dissection, become entirely transparent under the lenses used by the Club; and thus, when kindly and rightly solicited, and in that love which becomes enthusiastic with all earnest students, do our friends the plants give up their long-kept secrets. No words that I can employ would give dimmest conception of the complex and beautiful cell structures revealed in this way, in the transparent leaf of *Sanguinaria.* The epidermal cells, with sinuous outlines on the upper and lower surfaces, may be seen to be distinct from the true cuticle, a point often obscure in the minds of botanists, then parenchymal cells of many forms, reaching out processes like friendly hands to join their fellows on either side, all *distinctly nucleated*, with all the intercellular spaces, we study now at *one* view. Doubtless, the day is coming in which a profounder study of cell forms and of cell position in plants will assume more importance in specific descriptions; even now we may decide between doubtful species in some ferns, by means of the peculiar marginal cells to be always found in the fronds. We are familiar too, in our Club work, with the latex vessels rendered apparent throughout the *entire leaf* without dissection, forming a complex system of anastomosing vessels, whose direction and distribution differ widely from that of the veins in many leaves, showing, by our processes of demonstration, the existence of distinct vascular walls. In some leaves, moreover, we have detected reservoirs for the latex, distinct from the vascular system, lying like innumerable lakelets in the parenchymal tissues, and filled with milky sap in the living leaf. These delicate organs are among the most difficult to study in natural position, but all such hindrance disappears before our new processes of investigation.

We have gathered the floating-heart, *Limnanthemum lacunosum*, from its soft cradle on the brown lakes and ponds of Jersey. Imbedded within this leaf are organs of curious and irregular form, giving off many curved or straight processes, organs having structural peculiarities unlike all other plant tissues, and possessing a physiological significance of much interest, but whose existence is unknown to botanists. I believe they are air reservoirs, because in life they are filled with air, and thus the floating-heart rides securely on the water, buoyed up by innumerable life-preservers which no slight accident will displace. The veins in this leaf are rudimentary or but slightly developed; the fibro-vascular tissue in them is exceedingly delicate, and the contiguous supporting cells, which are found so abundantly in leaves pendant from branches and swayed by the winds, are nearly absent in *Limnanthemum*, and this significant fact is only one in a long series which must be recognized in all attempts to explain the existence of special structures in organization.

But I am warned that this imperfect report of our work and of our play must conclude. The flowers have bidden us adieu, the beautiful birds that sang so sweetly in the summer time have gone into warmer climes, the green fields and pathless woods which lured us in the past are undressed and asleep, but all will return with the vernal sun. Not things but thoughts feed the intellectual life, and he who has most of thought knows most of life. What men think is more beautiful and enduring than their deeds, and that life which embodies and uses most thought is richest and the best. The fashionable world is illuminated by a sun which gives only a yellow light, but happily a higher standard than gold regulates values in the intellectual life.

SEVENTH ANNUAL REPORT

OF THE

Natural History Club of Philadelphia.

Read December 15, 1874.

BY

J. G. HUNT, M.D.

PUBLISHED BY ORDER OF THE CLUB.

PHILADELPHIA:
COLLINS, PRINTER, 705 JAYNE STREET.
1875.

SEVENTH ANNUAL REPORT

OF THE

NATURAL HISTORY CLUB OF PHILADELPHIA.

DECEMBER 15, 1874.

THE death of another year imposes upon me the duty of reporting to the Club some of the work and thoughts which have interested us at our meetings. I had indulged the hope that the harvester would have been excused from gleaning in fields where few seed had been sown, and where the harvest has not yielded an hundred fold. But the expressed wish of the Club to the contrary removes all hesitation, if not all doubt, and I proceed to offer, at this seventh annual meeting, a condensed retrospect for the year.

These annual meetings are pleasant station houses along life's intellectual railway, into which we enter for warmth and for refreshment; they seem to come at short intervals, because the train moves rapidly; useful, perhaps essential, in the estimation of most, we compare remembrances of the journey, pick out and repack for safer travel all that we have found beautiful and true, and we go forth thence better equipped to ride with less fear, and with finer intelligence, over the frail and perilous bridges man has erected across the wild chasms still separating us from the final home.

When the dying Goethe pathetically called for more light, he uttered the conscious need of every thoughtful mind. Above most men, his life was illuminated by surpassing intellectual brightness, and a sun-like genius warmed into being, and bestowed a power of comprehension which placed him largely in harmony with the great facts of knowledge and of nature, yet he consciously cried for more light.

The same intense want for larger knowledge we feel to-night. Around the life-pathway of every individual, nature has spread a world of beauty, of use, and of rich significance. Science does nothing, attempts nothing, but to interpret these facts to listening ears. Every space is filled. Atoms, mountains, rivers, the chromatic changing clouds, lower organizations, man, the vibrating glancing light bringing tidings from distant worlds, the melody of sound, sweet pathetic music. What did Jean Paul Richter mean when he said of music, "Thou speakest to me of things which in all my endless life I have not found, and shall not find?" the exclusive property of man; these are our teachers, our daily companions, and our playmates.

"The rounded world is fair to see,
Nine times folded in mystery;
Though baffled seers cannot impart
The secret of its laboring heart,
Throb thine with nature's throbbing breast,
And all is clear from east to west.
Spirit that lurks each form within
Beckons to spirit of its kin;
Self-kindled every atom glows,
And hints the future which it owes."

There is no time for idleness. Quite too much for one mind, perhaps, yet a comprehension of their phenomena becomes easy by the association of many minds, each working in a special line directed by natural inclination, then bringing to the common table all that has been found beautiful and true.

Moreover, the intellectual habits developed and acquired by the systematic study of natural science, are of highest value in all true education. To observe accurately and with patience inexhaustible; to detect minute differences in form, structure, or color; to learn to compare thing with thing; to discover resemblances or analogies which often link whole series of phenomena together; thus to look beneath the apparent outside of things into the reality or obscure meaning; to grow by such self-training into that delicate and possible harmony with life and its accompanying phenomena; then to adopt a language, brief, analytical, expressive, which shall describe accurately just that which is observable and no more. This kind of training results in accuracy of thought and in equal accuracy of expression—mental traits not found except among those who cultivate the intellectual life. I will be understood when I say that this mental training is of more value to the student of natural science than any knowledge of fact or group of facts he may ever be called to study.

We all acknowledge the unabated interest that has drawn us together at our regular Club meetings. Some fresh thought or unknown object quietly presented by a member, and its explanation given at the time or referred to a committee for future report, if necessary, informal papers read on many subjects, reports of excursions to places of special interest, and of summer travel, have been the means of bringing to our meetings subjects in variety enough to interest all. Original scientific investigation is not to be expected of those who are compelled to spend their time in life's compulsory duties. Even to those more favorably situated and disposed to work out some line of original research, the encouragement given by those in authority is so grudging and meagre, so jealous and depreciating, that the student may well turn with distrust from the so-called and accidental leaders of thought, and rely solely upon his own convictions for compensation in his work. Obsequiousness to shallow authority is the passport to popular favor, but the loyal student of science is too rich to pay the price.

Entomology has claimed our attention at several meetings. The main features of classification in several natural orders, together with observations on particular insects, are recorded in the minutes. The circulation in Aphis rosæ was described by a member. Though only about the one-thirtieth of an inch in size, the creature possessed a central pulsating cavity—the dorsal vessel—filled with intra-visceral fluid, whose motions gave the only evidence of life, except an occasional sluggish oscillation of one of its long unwieldy legs. This central cavity pulsated with varying degrees of rapidity. Sometimes it beat three or four times in a minute, but under the stimulus of heat they were quickened to thirty or forty in the same fraction of time. The circulation is best seen from the dorsal aspect. The pulsations consist of waves usually commencing at the caudal extremity; sometimes, however, these waves meet in the centre, causing much consternation in the granular contents of the cavity. Its blood was without red corpuscles, resembling in that respect the blood of all insects; it was therefore colorless, and was rendered visible only by the granules it contained, yet it was a blood capable of carrying nutrition to all the delicate parts, capable, too, of restoring mutilations, and, according to observations of Bonnet on the reproduction of Aphis, this colorless blood can transmit its like through nine asexual generations—Duval says eleven—while Kyber traced its influence, without renewal, through successive generations for four years.

In our biological studies we meet with many strange analogies. This marvellous multiplication of plant-lice is only an increase by protoplasmic gemmation, analogous with, but more complex than gemmation in common yeast, in pus, and in Häckel's low order of animals, the Protista. In our own bodies, moreover, in those malignant carcinomatous degenerations, the living matter, assuming new properties, we know not how nor why, increases with even greater rapidity by gemmation than the probably analogous division in Aphis. It is not claimed that all these phenomena are identical, only that a close analogy runs through the series, viz., division of living matter by gemmation as contrasted with true reproduction. The potentialities of matter are not all written in the books. Day by day this degraded servant of the Infinite is advancing to a higher and more respectable position in the realm of scientific thought. Day by day it is extinguishing the untenable assumptions of a bigoted superstition, and is substituting for the degrading fictions of credulous imagination the demonstrated realities of everlasting truth. "He who knows most truth, he who knows what sweets and virtues are in the ground, the waters, the plants, the heavens, and how to come at these enchantments, is the rich and royal man." "Nature is loved by what is best in us. We study her too often selfishly and as a trade. Astronomy to the selfish becomes astrology; psychology, mesmerism (with intent to show where our spoons are gone), and anatomy and physiology becomes phrenology and palmistry."

The peculiar and various sounds emitted by insects, with a description of the musical organs in some species, were interestingly explained by a lady member. Generally speaking, those insects which fly with greatest swiftness and force make most noise, while those that fly gently and leisurely, and visibly fan the air with their wings, produce but little if any sound. With the exception of one or two species (as Cossus ligniperda for instance, which is said to emulate the booming of beetles by means of its large stiff wings), the Lepidoptera emit no sound while flying. The Neuroptera glide through the air in silence. The hornet, the wasp, and the bee, among the Hymenoptera, are zealous hummers. Our common honey-bee flaps his silken wings 4330 times per second on his pollen-laden journey among the flowers, in order to produce his peculiar buzz. But the noisiest wings belong to the Diptera. Flies and gnats, all the world over, are the most musical or offensive, just as we choose to view it. The wings of the common musquito are fringed on one side with numerous feathers which project beyond the surface, and these plumed wind-harps, rapidly vibrating in the hot, still air of a summer night, make that felicitous, Eolian murmur, which wakes the sensitive sleeper as surely as the boom of cannon.

Many insects emit sounds by means of special organs for that purpose. The reverberating song of the Katy-did comes from serrated organs on its wing-cases, which the insect rubs together. It is not difficult to observe the operation if a few of these quaint and semi-social insects are brought home and fed on fresh leaves. It seldom rains when the Cicada beats its kettle-drums in the tree-tops. The cricket, too, is furnished with horny fiddles on its wing-cases, and few entomological sights are more interesting than to see these natural musicians operating. Bring home from the fields some warm day next October, a handful of crickets, and turn them loose in the house, and their vesper songs will mingle with those of the family, and amply repay for the trouble. Resting mainly on her fore legs, with the hinder ones slightly elevated on tip-toe, she merrily files her song, while she deposits, at intervals, her eggs for the coming year. Andrews Norton loved the crickets. So do all the children.

"I love, thou little chirping thing,
To hear thy melancholy noise;
Though thou to Fancy's ear may sing
Of summer past and fading joys.

"I love the night, and, sooth to say,
Before the merry birds that sing
In all the glare and noise of day,
Prefer the cricket's grating wing."

Many beetles emit a noise while eating, and the Passalus cornutus sends forth an audible squeal when suddenly dashed with cold water. That these creatures have means of communicating with each other beyond our comprehension is not doubted by best observers. The emotions of fear, anger, joy, and love, it is probable, are all expressed by peculiar sounds. The formidable-looking larva of Ceratocampus regalis, when disturbed while feeding, erects its ten horns, shakes its head menacingly from side to side, and utters a sharp snapping sound, a fact not mentioned in the descriptions of this insect. It is probable, therefore, that insects possess three modes of emitting sounds: First, by vibrations of their wings; second, by means of special organs, as in Cicadas and crickets; and, thirdly, by some voluntary control over their respiratory organs not clearly understood.

A curious set of organs in the antenna of many insects has been discovered recently by Dr. Hicks, of England, which probably are organs of hearing. "Each organ is a cavity, hollowed out in the horny integument, sometimes nearly spherical, often flask-shaped, and prolonged into numerous extensions formed by foldings in the lining membrane." I have seen them often, and in the antenna of many insects they can be demonstrated without difficulty.

Thirty-two vibrations per second give the lowest note that we can hear; about sixteen thousand three hundred and eighty make the last trill in the highest octave ever heard by man. Beyond this limit sound may exist for organizations more impressible than our own, but the human ear is lost in the deep silence of inarticulate death. Between these extremes lie all earth's noises, whether the faint squeal of Passalus taking his bath, or the awful thunder making the clouds weep and earth tremble. Only a shiver in the atmosphere we breathe, and nature is revealed as a song-chanting mother, sweetly filling her weary children with adoration and voiceless prayer.

Remembrance goes back to those halcyon April days when Flora so charmingly opened her fragrant panorama. How precious seem the spring flowers—those early comers after the void and cold of winter! Anemones nodding in the odorous south wind; acres of Houstonia on woodland slopes—purity's flower with upward look—zephyrs plowing mimic waves in the floral sea; modest violets—the children's joy—sideways glancing from dead protecting leaves—death ever protects what is purest and best—later in life ripening *beneath* the surface. Suggestive blossoms, these and all the others. Ye have gone from us tonight, but your memory is sweet like the fragrance you shed abroad in the spring-time. You are my music and my poetry—you have told me of that for which I have been listening since childhood. A tongue when I was dumb, bread when I was hungry, water when thirsty have ye been to me. Your language is incorruptible and holy. Whoso learns one of the many-voiced dialects in which truth utters her oracles to the soul, never forgets. It becomes an inheritance forever. The lover of nature is best qualified to love wisely and not ignorantly that which is truly lovely in his own kind.

The ferns, too, have been before us for recognition and deeper study. Their morphology we have found to be distinctive in some species. Schizæa pusilla (Pursh) is unlike all other native ferns in the arrangement of its cells. The distinctive characters are minute projections from all sides of the parenchymal cells, so that the union of contiguous cells by means of these outgrowths forms a connected system of intercellular passages throughout the fern. Its only other Schizaceous ally, the Lygodium, is unlike it in morphology, though similar in fructification. Moreover, the stomata in Schizæa are in two rows only, on the frond, while in Lygodium they are scattered equally all over it. In Aspidium marginale the large stomata are clustered between the veins and are not found near them. The general rule is that the long axes of the stomata lie parallel with the veins; exceptions, however, exist. In Woodsia the frond is surrounded with a single row of large cells of distinctive form, giving it the appearance of being set in a frame.

Among the still lower plants we have found objects of serious thought and many beautiful organizations. The symmetrical desmids, often cresent-shaped like the new moon in the sky, or, drawn with more geometrical pencil wherein one, many-angled side, exactly resembles the other, green and sparkling with life, and pouring through their transparent valves that mysterious protoplasmic current which baffles the penetration of the botanist, but impresses his imagination with the conviction that some vision from the beyond and invisible—from a land were streams may rush, yet make no sound—has been granted him, have been studied by the Club. We gaze on this marvellous circulation, but hear no sound of rushing waters, yet the boiling eddies transport microscopic bowlders in their currents. In the vegetable world the circulation, though rapid and powerful, is silent; in the animal world it is often audible.

The Oscillatoria mobile and jointed—those vegetable annulosa—ever gliding, we know not whither, at one time right onward in space, at another mysteriously coiling through some segment of nature's universal spiral, have filled us not only with wonder but with the conviction that work yet awaits the doing, even among the common things of life. Life always moves in an upward direction. Its aspirations are towards the sun, its recognized source and fountain. The snow-capped granite peak—the hard brown clay which the farmer turns often so thoughtlessly with his plow, except for the gold it may bring him, have not felt this aspiration and are dumb. They are only waiting. The amœba and oscillatoria—representatives of the animal and vegetable life—equally material with the granite and the clay, holding analogous chemical elements in their bodies, acknowledge the new inspiration, and move and select with apparent volition. Have they then entered the lower fog-obscured border of the great cloud of consciousness hanging over all? The tall trees in our city parks have bemoaned to me, on windy nights, with a sad far-reaching voice their rooted attachment to the soil. The beasts of the fields, yet fattening in the great nursery of time, have risen higher, and we grant them instinct. Men and women, the lords and ladies among the aspiring children of the Infinite, have obeyed a little more fully the Divine invitation to "come up hither"—have entered further on into consciousness, and it is said that we think, and will, and reason. It may be so. From our simple Club studies among the plants we begin to see the significance of some things. The naviculas, the oscillatorias and desmids still inhabit the border land of sense phenomena; the droseras, dioneas, nepenthes, cephalotus, Darlingtonias, and Sarracenias, having risen higher into consciousness, already set traps for insects in the swamps.

The subject of crystallization in plants has given us some hours of profitable study. Few persons not instructed in special departments of science have any conception of the extreme beauty and abundance of these crystalline deposits. In our common nettle (Urtica), aggregations called cystoliths exist all over the leaf. This name is given them because the crystals are encysted within a special cell, and are attached moreover to the wall of the cell by a delicate filament, thus differing from all other cell-contents. I have counted four hundred cystoliths in one square inch of nettle leaf, and each cystolith contains about one hundred separate crystals; there are, therefore, about forty thousand crystals in an inch of nettle leaf. In Pilea mucosa—a near ally of the nettle—are found cystoliths of gigantic size and differing widely from all other forms hitherto described. They are elongated and bent in form, and lie in cells measuring only the 1-70th of an inch long, and the 1-650th wide, and so abundant that quite one-third of the entire leaf is occupied with them.

The true raphides are found in unrivalled beauty and abundance in our common Fuchsia leaf. The flower of this favorite plant attracts all observers by its singular beauty of form and color, but the morphological botanist finds, in its overlooked leaf, crystalline splendors which shall remain after the painted blossom shall wither and decay. In this leaf the large raphidial cells often overlie and obscure the veins for some distance, and along the leaf-margins they are specially abundant. I have not seen them mentioned in the books. Our common orchids have their tissues laden with raphides, and generally in special cells of gigantic size. All crystalline deposits in plants are best seen and studied in natural position, and without dissection, and with all the surrounding tissues unmutilated.

Cassia chamæcrista, which we often see covering fields in Jersey with its pretty yellow flowers, has its stems and veins filled with minute well-defined crystals. In each pinnate leaf, I have estimated many thousands; how incaluable then the amount of mineral matter taken from the soil by these plants! In the eye of the botanist, a clover field is a field of crystal, for every vein in every leaf contains thousands; and every man or woman who eats peas for dinner, swallows more crystals than are contained in all the cabinets in the world.

The salts of lime, soda, and potash, make up these wonderful crystalline tissues in plants, but their precise origin and significance in the economy of the plant we do not understand. The leguminosa, so largely used as food for cattle and by man, abound in crystals. Have they any relation to the nutrition of animal life? Do our domestic animals obtain the mineral salts their tissues need from their microscopic crystals, invisible, but abundant, and prepared in advance to meet a want, a necessity of life which came with the first animal? Will scientific agriculture answer such questions? Or, are these plant-crystals, plant skeletons, and only foreshadows of sponge spicules, and higher skeletons, more perfectly elaborated and articulated further on in life?

We have noticed too the peculiar ice-crystals found occasionally in early winter, around the stems of cunila and helianthemum. Sometimes these ice-crystals are four inches in length, always opposite, and two or four in number. No satisfactory theory of their formation has been offered, and the subject remains to be worked out in the future by some member of the Club.

Our microscopes, wisely directed and skilfully used, reveal at our meetings, worlds of wonder and instruction, into which the uninitiated cannot enter. Many years ago, when all this portion of the earth's surface was being plowed and ground beneath the moving and receding ice-fields of the glacial epoch, leaving at intervals patches of dry land and swamp as feeding-places for animal life, the Mastodon roamed among the few trees then growing, perhaps the largest of all the animals.

Man had not yet, or only come upon the scene. What did those Mastodons eat? Their teeth show that they were herbivorous. But what kinds of vegetables supplied their necessities? Our microscopes furnish the answer. We have examined portions of a Mastodon's dinner, exhumed recently in New York State, at least the material was found in the animal, and occupied the place where the stomach formerly was, and found fragments of bark and fibres of wood, pieces of stems of rush-like plants, mosses and many spores, spiral vessels from higher plants, and bodies resembling water-fleas or entomostraca. Now, if these remains came from the Mastodon, and there exists not the slightest reason to doubt it, they were eaten and entombed long anterior to the oldest mummy in Egypt, and yet the cells in the plants were almost as distinct as the cells in plants of recent date. Mastodons therefore ate the tender branches of the shrubs and trees and sedge-like plants and mosses which grew on the margins and in the ancient swamps, and it is probable the pines or terebinthinate plants were not eaten by the monsters for food, for none of their remains were found in the mass. Cases like this show the importance of thorough study, and familiar acquaintance with the morphology, not only of plants, but of all organizations. These gastric remains of the Mastodon were black as ink, and were preserved almost unchanged by the animal charcoal which enveloped them, so that we know he died by some accident soon after he had eaten, and before digestion had advanced far. That man existed contemporary with the Mastodon, and other now extinct mammals of the post-tertiary period, is a probable fact, but the immense glaciers which filled the Mohawk and Susquehanna valleys, and which were from four to six thousand feet thick, for there are ice-scratches on the summit of Mount Washington, filling moreover all the valleys in New England and New York, allowed him little room for travel.

The old era and way of studying plants have passed away. It was only glacial, or post-tertiary. Scientific botany requires of her students now, to know the form and optical expression of every cell, and gland, and crystal, and wondrous spiral that builds the tree. His knowledge of function will then be based on and grow out of his knowledge of form. To all this he will add, use or service in mechanics, for food or for medicine. Moreover, thorough study like this exalting our own sense of the possibilities of organization, we become intimate indwellers in many beautiful temples not made by man, familiar abodes which we enter, not for the revel of a day, but for those finer thought-compensations which shall endure through time.

Our members have wandered far during the summer holiday. From the Isles of Shoals to Colorado; from the fertile agricultural garden of central Pennsylvania to the picturesque, unmatched "Garden of the Gods" in the far west. How shall I follow the nomads? I, so unpractised a traveller! Many beautiful remembrances have been sent us, many valuable observations recorded of mountain and river, of cataract in the solemn wood, lifting its voice among the bemoaning trees, heard but rarely by man, of the sea-like lakes over whose glassy bosom you sail in glory through starry nights and summer days, and of the primeval silent forests on their shores, of the eternal ice and snow, crowning with fadeless light the inaccessible mountain, then of the ocean, grand, restless, unsatisfying :—

—"The hidden deeps,
Where tide, the moonslave sleeps.
Where the wind breathes not, and the wave
Walks softly, as above a grave ;—
Where coral worms in countless nations,
Build rocks up from the sea's foundations;
Where the islands strike their roots
   Far from the old mainland ;
And spring like desert-fruits,
   Shook off by God's strong hand,
   Up from their bed of sand."

My incompetence to become your reporter is keenly felt as I record only those facts of seeming value.

The Isles of Shoals are simply a group of rocks, no beach, no sand, no sea-bathing for the traveller; scarcely a pebble is to be seen. The waves dash against the hard granite, wearing out the softer trap, making gorges into which the waters rush, breaking and dashing against the rocky sides. A thin soil is found between the rocks, and in some places are patches of grass on which lean cows feed discontentedly. Only one small tree was to be seen. The flora of the Isles is not extensive.

Many storm-nursed cryptogams are on the rocks—the individuals numerous, the species few. Wild roses are abundant and of richer color than ordinary. Myrica cerifera (L.), Houstonia cerulea (L.), Anagallis arvensis (L.), Potentilla tridentata (Ait.), Arenaria lateriflora (L.), Ranunculus cymbalaria (Pursh), Plantago maritima (L.), and Calystegia sepium (R. Br.), managed, here and there, to get a foothold. When the tide recedes Fucus vesiculosus and a richer marine flora encircles the rocks.

The appended catalogue of plants will render it unnecessary to repeat their names in my report except in rarest instances. At Rieglesville on the Delaware, Sedum Rhodiola (D. C.), lone lingerer among the rocks from the glacial period, is reported by a member. The upper tributaries of this river are remarkable for their picturesque waterfalls. Bushkill, Raymondskill, Sawkill, and Dingman's are pleasant remembrances for some of the Club. How grateful was the dash of their leaping waters! How refreshing, how cool in the hot summer time, the breath from their wet lips! Linger, ever linger, such visions of beauty—such notes in the grand anthem—ye are only partial revealings of the All Beautiful who abideth everywhere. The mountain needs the cataract. The voice of falling water girdles the earth, it greets the traveller in every land. It is the world's household voice. Falling water only is noisy or articulate, water ascending towards heaven in vapor is silent, it has no voice.

Our members now absent in the Alps have sent pleasant greetings from many places they have visited. The glacier drinking eternal draughts from snow-clad mountains, the flower-spangled valley of the Engadine; cities that were old before our dear native land was recorded on the maps, with libraries and museums of art, rich in learning and treasure, have been described with poetic enthusiasm and with truth. The popular idea of foreign scenery is obtained from romances written in books or in newspapers; everything is painted in vermilion tints, the sun is always sinking to rest in a couch of glory, and the flowers are always in full bloom. Blessed are the lands beyond the sea. All things have the perfume and color of the rose! The vision of the traveller becomes unconsciously doubly refractive, and he sees everything under polarized light. But the true and abiding reality we gather from authorized surveyings and geological reports, wherein all things are officially balanced. There is no enthusiasm in weights and measures. Trigonometry, though an artist, deals not in color. The plants gathered in the Alps, with those from Colorado, brought home by another worker in our little hive, will be appended to my report. I will not attempt a fragmentary and imperfect analysis of the charming and valuable record of a few weeks' botanizing in Colorado, which was read at a recent meeting. The record of the plants found in that distant region, and which are unknown at home, gives it more than transient value. Words have the power, when fitly used, to stand as conscious emblems of natural phenomena. And thus may the distant mountain chain, snow-wrapped, frigid giants of a former epoch, cutting the remoter blue with serrations which change not through centuries, unalterable as time, though unseen by us home-dwellers, become our possessions forever. Grateful are we for these reports. They are jewels set in the grosser alloy of the ring of our common studies. Not as glittering trinkets in the ears to be seen by all, but as solitary diamonds hidden in the private recollection of every member do we keep them, and their sparkle and delicate light will remain with us after the occasion has passed away.

The retrospect of our work is completed. You have detected that less has been reported than has been omitted, but my reluctance to multiply words compels me to stop. For seven years—at intervals of time—we have been mutual observers of common things. Self-help is the only real help. How significant the fact that eyes and ears are added to human organizations! How profoundly suggestive that a receiving, registering, and co-ordinating brain crowns with glory the habitation in which we live for a season. Life, as we know it, is not the exclusive possession of the individual. It is a loan granted on usurious interest, full payment to be rendered *daily*, until the principal is withdrawn. Shall we then through indolence or fear permit others to put out our eyes and stop our ears, or forbid the mind, that "unslumbering but veiled and pensive enchantress," to look over the pictures hanging in the registering galleries of the brain, and combine them for our own use and our enjoyment forever? I anticipate your answer. Society is filled with moral and with intellectual cripples, but our emotional development has outgrown the intellectual. If we have found restoration and an antidote in the daily contemplation of natural phenomena as they appear to our own senses, and if we venture persuasively and lovingly, and in this simple way to say so to our friends assembled with us to-night; we also ask them, as they hereafter walk life's pathway, to see but with their own eyes, to hear but with their own ears, to think but with their own brains, to come and to do likewise.

J. G. H.

A LIST

OF THE

More interesting Plants identified by the Club during the Year 1874.

Ranunculaceæ. Clematis Scottii, Porter, Grand Cañon of the Arkansas; C. ligusticifolia, Nutt., Colorado Springs; Anemone parviflora, Mx., Minneapolis, Minnesota; Thalictrum Fendleri, Eng., Cañon City, Col.; Ranunculus Cymbalaria, Pursh, Cañon City, Col., Appledore, Isles of Shoals; Caltha leptosepala, DC., Aquilegia cærulea, Torr., Delphinium elatum, L., var. occidentale, Watson, Argentine Pass, Snowy Range, Col.; D. scopulorum, Gray, Glen Eyrie, Col.

Sarraceniaceæ. Sarracenia variolaris, Mx., Florida.

Papaveraceæ. Argemone Mexicana, L., Denver, Col.

Fumariaceæ. Corydalis glauca, Pursh, C. aurea, Willd., Duluth, Minn.; C. aurea, L., var. curvisiliqua, Eng., Grand Cañon of the Arkansas.

Cruciferæ. Cardamine cordifolia, Gr., Argentine Pass, Col.; Arabis Drummondii, Gr., Duluth, Minn.; Sisymbrium canescens, Nutt., Manitou Islands, Lake Huron; Stanleya pinnatifida, Nutt., Glen Eyrie, Col.; Thelypodium linearifolium, Gr., Cañon City, Col.; T. Wrightii, Gr., Grand Cañon of the Arkansas, Col.; Lepidium alyssoides, Gr., Colorado Springs.

Capparidaceæ. Cleome integrifolia, T. & G., Denver, Col.; Polanisia uniglandulosa, DC., Colorado Springs.

Cistaceæ. Helianthemum Carolinianum, Mx., Charleston, S. C.

Caryophyllaceæ. Silene acaulis, L., Arenaria arctica, Stev., var. obtusa, T. & G.; A. alpina, L., Argentine Pass, Col.; A. lateriflora, L., Appledore, Isles of Shoals; A. peploides, L., Cape May, N. J.

Portulacaceæ. Talinum teretifolium, Pursh, Grand Cañon of the Arkansas; Claytonia arctica, Adams., var. megarhiza, Gr., Argentine Pass, Col.

Malvaceæ. Malvastrum coccineum, Gr., M. angustum, Gray, Cañon City, Col.

Linaceæ. Linum perenne, L., Cañon City, Col.

Geraniaceæ. Geranium pusillum, L., Nepigon Bay, Lake Superior; G. Richardsonii, F. & M., Cañon City, Col.; G. Fremontii, Torr., Colorado Divide.

Rutaceæ. Ptelea angustifolia, Benth., Cañon City, Colorado.

Anacardiaceæ. Rhus aromatica, Ait., var. trilobata, Gr., Colorado Divide.

Celastrineæ. Pachystima myrsinites, Raf., Argentine Pass, Snowy Range, Col.

Sapindaceæ. Æsculus Pavia, L., Lady's Island, S. C.; Acer glabrum, Torr., Glen Eyrie, Col.

Leguminosæ. Lupinus argenteus, Pursh, Denver, Col.; Trifolium dasyphyllum, T. & G., T. Parryi, Gr., Argentine Pass, Col.; Psoralea floribunda, Nutt., Dalea Jamesii, Torr., Cañon City, Col.; Petalostemon violaceus, Mx., Colorado Springs; P. candidus, Mx., Grand Cañon of the Arkansas; Amorpha canescens, Nutt., Minneapolis, Minn.

Rosaceæ. Prunus Chicasa, Mx., P. Caroliniana, Ait., Beaufort, S. C.; Spiræa dumosa, Nutt., Grand Cañon of the Arkansas; Geum macrophyllum, Willd., Duluth, Minn.; G. Rossii, Seringe, Argentine Pass, Snowy Range, Col.; Potentilla palustris, Scop., Superior City, Wis.; Rubus Nutkanus, Mocino, Duluth, Minn.; R. deliciosus, Torr., Glen Eyrie, Col.; R. triflorus, Richardson, Duluth, Minn.; R. trivialis, Mx., Beaufort, S. C.; Cercocarpus parvifolius, Nutt., Grand Cañon of the Arkansas; Rosa blanda, Ait., Cañon City, Col.; R. lævigata, Michx., Charleston, S. C.; Pyrus sambucifolia, Cham. & Schlecht., Michipicoten Island, Lake Superior and Engelman's Cañon, Col.

Saxifragaceæ. Ribes leptanthum, Gr., R. cereum, Dougl., Grand Cañon of the Arkansas, Col.; Jamesia Americana, T. &. G., Glen Eyrie, Col.; Philadelphus microphyllus, Gr., Grand Cañon of the Arkansas, Col.; Saxifraga punctata, L., Argentine Pass, Snowy Range, Col.

Crassulaceæ. Sedum Rhodiola, DC., Argentine Pass, Col.; S. stenopetalum, Pursh, Grand Cañon of the Arkansas.

Onagraceæ. Epilobium alpinum, L., Argentine Pass, Col.; E. latifolium, L., Œnothera pinnatifida, Nutt., Œ. cæspitosa, Nutt., Cañon City, Col.

Loasaceæ. Mentzelia nuda, T. & G., Denver, Col.; M. albicaulis, Dougl., Cañon City, Col.; M. multiflora, Nutt., Colorado Divide.

Cactaceæ. Cereus viridiflorus, Eng., Grand Cañon of the Arkansas.

Cucurbitaceæ. Cucurbita perennis, Gr., Cañon City, Col.

Umbelliferæ. Thaspium trachypleurum, Gr., Grand Cañon of the Arkansas.

Cornaceæ. Cornus pubescens, Nutt., Ute Pass, Colorado.

Caprifoliaceæ. Linnæa borealis, Gronov., Batcheewanaung Bay, Lake Superior; Symphoricarpus montanus, H. B. K., Grand Cañon of the Arkansas; S. occidentalis, R. Brown, Cañon City, Col.; S. racemosus, Mx., Lonicera hirsuta, Eaton, Batcheewanaung Bay, Lake Superior.

Rubiaceæ. Houstonia rotundifolia, Mx., Charleston, S. C.

Compositæ. Liatris punctata, Hook, Grand Cañon of the Arkansas; Gutierrezia Euthamiæ, T. & G.; Aplopappus Fremontii, Gr., Cañon City, Col.; Grindelia squarrosa, Dunal., Chrysopsis villosa, Nutt., Denver, Col.; Melampodium cinereum, DC., Cañon City, Col.; Helianthus lenticularis, Dougl., Denver, Col.; Thelesperma filifolium, Gr., Colorado Springs; Bidens tenuisecta, Gr., Ute Pass, Col.; Ximenesia encelioides, Cav., Gaillardia pinnatifida, Torr., Actinella acaulis, L., Gnaphalium luteo-album, L., var. Sprengelii, Eaton, Senecio filifolius, Nutt., var. Jamesii, T. & G., Cañon City, Col.; Nabalus virgatus, DC., Atsion, N. J.; Lygodesmia juncea, Don., Denver, Col.; Taraxacum palustre, DC., Argentine Pass, Col.

Lobeliaceæ. Lobelia Canbyi, Gr., Atsion, N. J.

Campanulaceæ. Campanula rotundifolia, L., var. linifolia, Glen Eyrie, Col.; C. Langsdorffiana, Fisch.; C. uniflora, DC., Argentine Pass, Col.

Ericaceæ. Chiogenes hispidula, T. & G., Kaministiquia River, Lake Superior; Arctostaphylos Uva-ursi, Spreng., Engelman's Cañon, Col.

Aquifoliaceæ. Ilex Cassine, L., Beaufort, S. C.

Primulaceæ. Primula Parryi, Gr., Argentine Pass, Snowy Range, Col.

Lentibulaceæ. Utricularia vulgaris, L., Superior City, Wis.

Scrophulariaceæ. Pentstemon barbatus, Nutt., var. Torreyi, Gr., Ute Pass, Col.; P. glaber, Pursh, Colorado Springs; P. humilis, Nutt., Grand Cañon of the Arkansas; Gratiola sphærocarpa, Ell., Charleston, S. C.; Gerardia maritima, Raf., Pemberton, N. J.; Castilleia breviflora, Gr., Argentine Pass, Col.; C. integra, Gr., Grand Cañon of the Arkansas; C. pallida, Kunth, and var. miniata, Gr., Argentine Pass, Col.

Verbenaceæ. Verbena Aubletia, L., Cañon City, Col.

Labiatæ. Hedeoma Drummondii, Benth., Glen Eyrie, Col.; Scutellaria resinosa, Torr., Cañon City, Col.; S. galericulata, L., Kaministiquia River, Lake Superior; Salvia lanceolata, Willd., Cañon City, Col.

Borraginaceæ. Mertensia paniculata, Don., Duluth, Minn.; M. Siberica, Don., Glen Eyrie, Col.; M. alpina, Don., Argentine Pass, Col.; Eritrichium glomeratum, DC., Cañon City, Col.

Polemoniaceæ. Gilia aggregata, Spreng., Colorado Divide; G. pinnatifida, Nutt., G. inconspicua, Dougl., Cañon City, Col.; Polemonium humile, Willd., Argentine Pass, Col.

Convolvulaceæ. Ipomœa leptophylla, Torr., Denver, Col.; Convolvulus lobatus, Eng. & Gr., Evolvulus argenteus, Pursh, Cañon City, Col.

Solanaceæ. Solanum triflorum, Nutt., Manitou Springs, Col.; S. rostratum, Dunal., Denver, Col.; Physalis lobata, Torr., Cañon City, Col.

Gentianaceæ. Halenia deflexa, Gris., Duluth, Minn.; Gentiana angustifolia, Mx., Atsion, N. J.; G. frigida, Hænke, var. algida, Pall.; G. Parryi, Engelm., Swertia perennis, L., Argentine Pass, Col.; Menyanthes trifoliata, L., Superior City, Wis.; Limnanthemum lacunosum, Gris., Bristol, Penna.

Asclepiadaceæ. Asclepias Jamesii, Torr., Cañon City, Col.

Nyctaginaceæ. Mirabilis multiflora, Gr., Cañon City, Col.; Oxybaphus hirsutus, Sweet., Engelman's Cañon, Col.; O. angustifolius, Sweet., Colorado Springs, Col.

CHENOPODIACEÆ. Blitum maritimum, Nutt., Cape May, N. J.; B. capitatum, L., Duluth, Minn.; Atriplex patula, L., Cañon City, Col.

POLYGONACEÆ. Eriogonum alatum, Torr., Engelman's Cañon, Col.; E. Jamesii, Benth., Cañon City, Col.; E. umbellatum, Torr., Grand Cañon of the Arkansas; E. annuum, Nutt., Colorado Springs; Polygonum Bistorta, L., var. oblongifolium, Meisn., Argentine Pass, Col.; P. maritimum, L., Cape May, N. J.

ELÆAGNACEÆ. Shepherdia Canadensis, Nutt., Manitou Islands, Lake Huron.

EUPHORBIACEÆ. Euphorbia petaloidea, Engelm., Grand Cañon of the Arkansas; E. marginata, Pursh, Denver, Col.; Tragia nepetæfolia, var. ramosa, Müller, Croton Texensis, Müller, Cañon City, Col.

URTICACEÆ. Humulus Lupulus, L., Manitou Springs, Col.

CUPULIFERÆ. Quercus alba, L., var. Gunnisoni, Torr., Q. Emoryi, Torr., Grand Cañon of the Arkansas.

SALICACEÆ. Salix nigra, Marsh., Charleston, S. C.; S. arctica, Pall., var. Brownei, Anders., Argentine Pass, Col.; Populus balsamifera, L., var. angustifolia, Watson, Cañon City, Col.

CONIFERÆ. Pinus edulis, Engelm., Grand Cañon of the Arkansas.

ARACEÆ. Calla palustris, L., Superior City, Wis.

ALISMACEÆ. Triglochin maritimum, L., Cañon City, Col.

ORCHIDACEÆ. Habenaria hyperborea, R. Br., Duluth, Minn.; H. psycodes, Gray, Microstylis ophioglossoides, Nutt., White Mts., N. H.

AMARYLLIDACEÆ. Amaryllis Atamasco, L., Ashley River, S. C.

SMILACEÆ. Smilax auriculata, Walt., S. laurifolia, L., Beaufort, S. C.

LILIACEÆ. Trillium discolor, Wray, S. C.; Streptopus amplexifolius, DC., Glen Onoko, Penna.; S. roseus, Mx., Nepigon Bay, Lake Superior; Clintonia borealis, Raf., Duluth, Minn.; Smilacina stellata, Desf., Manitou Springs, Col.; Allium cernuum, Roth., Grand Cañon of the Arkansas.

GRAMINEÆ. Bouteloua oligostachya, Torr., B. curtipendula, Gray, Tricuspis mutica, Torr., T. acuminata, Munro., Cañon City, Col.; Tripsacum dactyloides, L., Schuylkill River, Phila.

FILICES. Polypodium incanum, Swartz., Savannah, Ga.; Cheilanthes lanuginosa, Nutt., C. Eatoni, Baker; Notholæna Fendleri, Kunze, Pellæa Wrightiana, Hook., Grand Cañon of the Arkansas; P. densa, Hook., California; Asplenium septentrionale, L., Grand Cañon of the Arkansas; A. montanum, Willd., Mt. Tammany, Del. Water Gap; Phegopteris Dryopteris, Fée, Duluth, Minn.; Aspidium fragrans, Swartz, White Mts., N. H.; A. Filix-mas, Swartz, Kaministiquia River, Lake Superior; Struthiopteris Germanica, Willd., Woodsia glabella, R. Br., White Mts., N. H.; W. Oregana, Eaton, Grand Cañon of the Arkansas; Schizæa pusilla, Pursh, Atsion, N. J.; Botrychium simplex, Hitch., B. lanceolatum, Angstroem, North Sandwich, N. H.

HYDROPTERIDES. Azolla Caroliniana, Willd., Florida.

3 1198 03610 8202
N/1198/03610/8202X

3 1198 03610 8202

N/1198/03610/8202X